

MODERN PLASTICS

OCTOBER 1954

How to Use POLYETHYLENE Effectively...Page 91

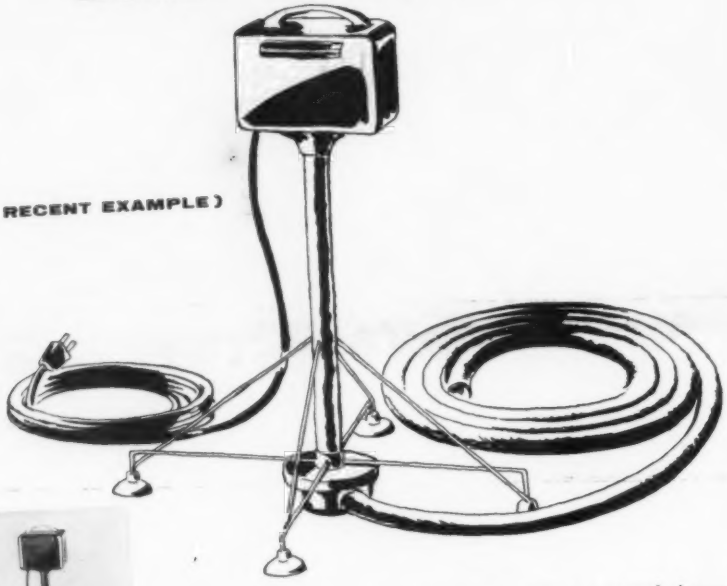
Saving Money by HOT-RUNNER Molding...Page 125

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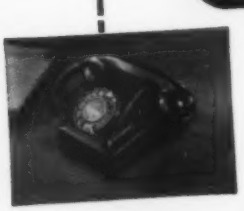


A new competitive edge in your business, a wider market for your product, may well be awaiting an original use of Durez phenolics. As molding compounds or processing resins, these plastics are putting greater sales appeal into new or redesigned products almost every day.

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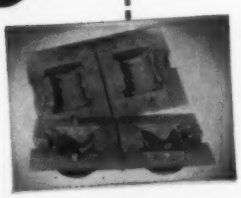


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MODERN PLASTICS*

October 1954 • Vol. 32 No. 2

CONTENTS

GENERAL SECTION

How to Harm the Plastics Industry (Editorial) ... 5

1954—Fastest Growing Plastic ... 91
Specialized design and proper molding methods for polyethylene will contribute to channelling a prospective billion pounds per year into applications which take advantage of the material's unique properties

Simpler Stereo ... 97
Super-functional examples of well-engineered applications are found in a new 3-dimensional camera and viewer designed for plastics

Production-Line Luggage ... 102
Slurry preforming cuts cost and improves physical properties of reinforced plastics luggage

Dispensed with Dispatch ... 105
Easy-to-use package for surgical tape, molded of styrene, opens an important new consumer market for plastics

Designed for Casement Windows ... 106
New room air conditioner has several large molded styrene parts; one is finished with permanent wood grain pattern

Plasticizers for the Vinyl Market ... 108
An analysis of latest U.S. Tariff Commission figures points out the uses for a variety of plasticizers

Color in Plastics ... 111
Part 4 of a Symposium in Print:

Coloring the Fluorocarbons ... 111
by James R. Jones

Color in Polyesters ... 113
by Merle Cowee and Eugene W. Moffett

New Limbs for Amputees ... 116
Strength and light weight of reinforced plastics are prime advantages in custom-made artificial arms and legs

Mold Making Method Holds Down Toy Costs .. 117
Gravity-cast beryllium copper hobs are made from plaster molds and used for pressure cast beryllium copper cavities

Trouble-Free Waxer ... 120
Functional beauty plus ample strength to take abuse are designed into a new cellulose acetate applicator-polisher head

Plastics Products ... 122
New uses of plastics in consumer items

Plastics Fences ... 196

Acrylic Windows ... 198

Vinyl Pipe ... 200

Plastics Chimes ... 202

Flexible Splint ... 205

Tool Kit Box ... 206

Melamine Cast ... 209

Posting Tray ... 213

PLASTICS ENGINEERING

Upgrading Fluorocarbon Moldings ... 125
by Carmen R. Giannotta
Quality of molding fluorocarbon parts is improved by use of special hot-runner molding technique

Glass Fabric Finishes Vs. Fiber Sizings ... 132
by L. M. Calhoun
What the plastics engineer should know about the difference between fabric finishes and sizings for rovings

Drying Ink on Polyethylene Film ... 137
by Gene Liberty
A discussion of experimental techniques aimed at further improvement in printing procedures

When and Why to Use Drape Forming ... 138
by George H. Howell
Answers to specific questions serve as a guide to the choice of vacuum-forming methods

TECHNICAL SECTION

Structural Laminates From Epoxy Resins ... 141
by D. W. Elam and F. C. Hopper

Determination of Apparent Molecular Weight of Polychlorotrifluoroethylene ... 146
by Herman S. Kaufman, Charles O. Kroncke, Jr., and Carmen R. Giannotta

Testing for Defects in Polyethylene Welds 150
by F. J. Bockhoff and J. A. Neumann

Measuring Yellowing and Darkening in Weathered Plastics ... 156
by W. C. Hunt and R. P. Bauman

DEPARTMENTS

Plastics Digest ... 160

U.S. Plastics Patents ... 170

New Machinery and Equipment ... 174

Books and Booklets ... 184

Production of Plastics Materials ... 194

Manufacturers' Literature ... 211

Classified Advertisements ... 268

Index of Advertisers ... 274

THE PLASTISCOPE ... 248
News of the Industry; Predictions and interpretations; Company News, Personal; Meetings

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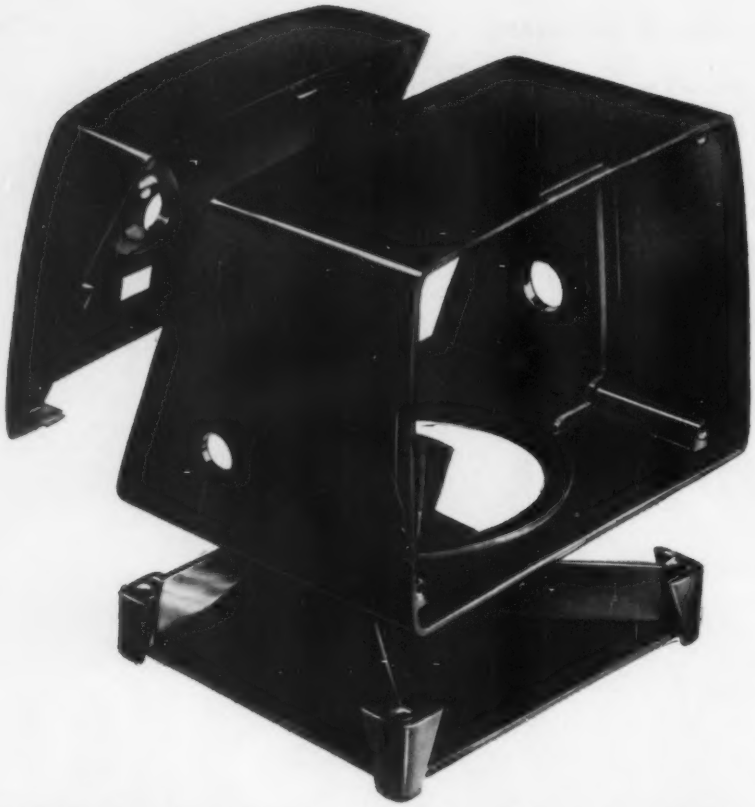
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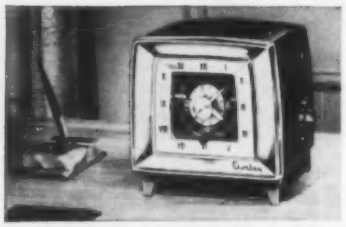
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EDITORIAL

How to Harm the Plastics Industry

A simple formula exists by the use of which any plastics company can do big and special damage to the plastics industry, to all other companies in it and, incidentally, to itself.

The formula functions best if the company concerned is in one of the "newer" and more "glamorous" phases of the industry, such as reinforced plastics, because the public is most gullible about highly-publicized materials.

The best vehicle for the use of the formula is advertising and sales literature related to a stock issue and appearing under the aegis of security underwriters and/or promoters. With this vehicle it is possible to do the damage at investor and management level.

Within the formula is a range of nasty techniques which may be used in various combinations to produce the damage to this industry:

Technique #1. Always refer to the plastics which the company uses, or proposes to use, as "wonder" or "miracle" materials.

Technique #2. Claim for these materials fantastic comparative properties. Say that they are "three times as strong as steel," that they will withstand a terrific range of service temperatures, and imply that they regularly offer properties heretofore never obtained in other materials.

Technique #3. Produce a list of products, whether prototype, experimental, pilot, or production, and imply that the company has big and steady business in these items—and that the items are all successful.

Technique #4. Lean heavily on experience with military applications, even if they have been purely developmental.

Technique #5. Be generous in predictions on the future growth of the use of these materials, ignoring all stymies such as flame resistance, rigidity, finishing, and comparative costs. Use out-of-context excerpts from addresses by public figures in the industry, to predict this fabulous future.

Technique #6. Make a tremendous point of know-how "exclusive" to the company and of patents obtained or applied for, which may or may not stand up in court.

Technique #7. By any and all means point up the company's extreme versatility, rather than its ability to concentrate.

Technique #8. Mention a few materials suppliers in such a way that there is an implication of relationship with and sponsorship by these big companies.

The use of these eight techniques in stock promotion literature may bring in capital. But at the same time they will lead the untutored business public to expect too much from the materials and processes as used by the company and the industry, they will cause people to waste time, money, and effort on "dream" products based on a misunderstanding of the materials, and will bring later heartbreak to many who must inevitably find out the plain truth that many things for which a promise is implied cannot be done soundly with plastics.

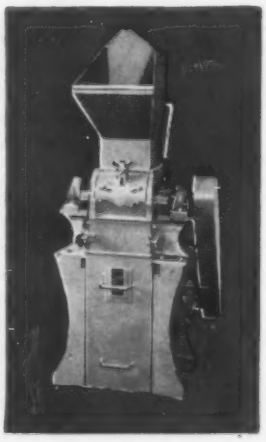
Meanwhile, to the plastics industry, such promotion causes shudders of embarrassment and to the sophisticated business public brings sneers at the lack of promotional ethics in the plastics industry.



more than 20 B&J LABORATORY '251' GRANULATORS help speed production at IDEAL TOY CORPORATION

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Beside the presses in Ideal Toy Corporation's New York factory, you'll find B & J Laboratory "251" Granulators—more than 20 in all. Operating steadily, these versatile machines handle gates, sprues, runners, small rejects, etc., at speeds up to 150 pounds an hour in any and all plastic materials, including polyethylene, without fluffing. The 8" x 8" throat opening is more than adequate for this type of scrap.



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Ideal's preference for B & J granulators is true of many other leading molders too—more than 5,000 B & J Granulators have been sold.

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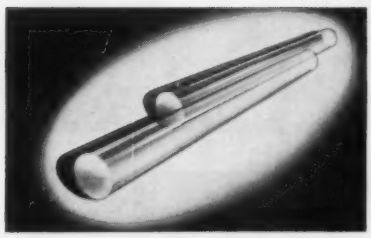
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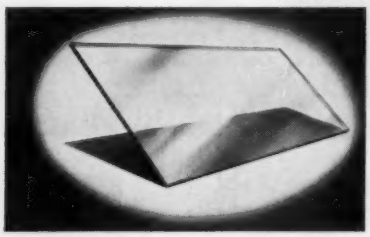
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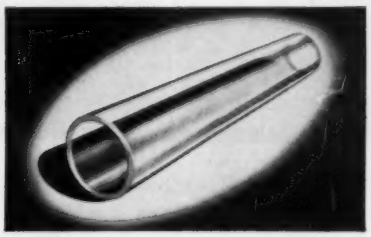
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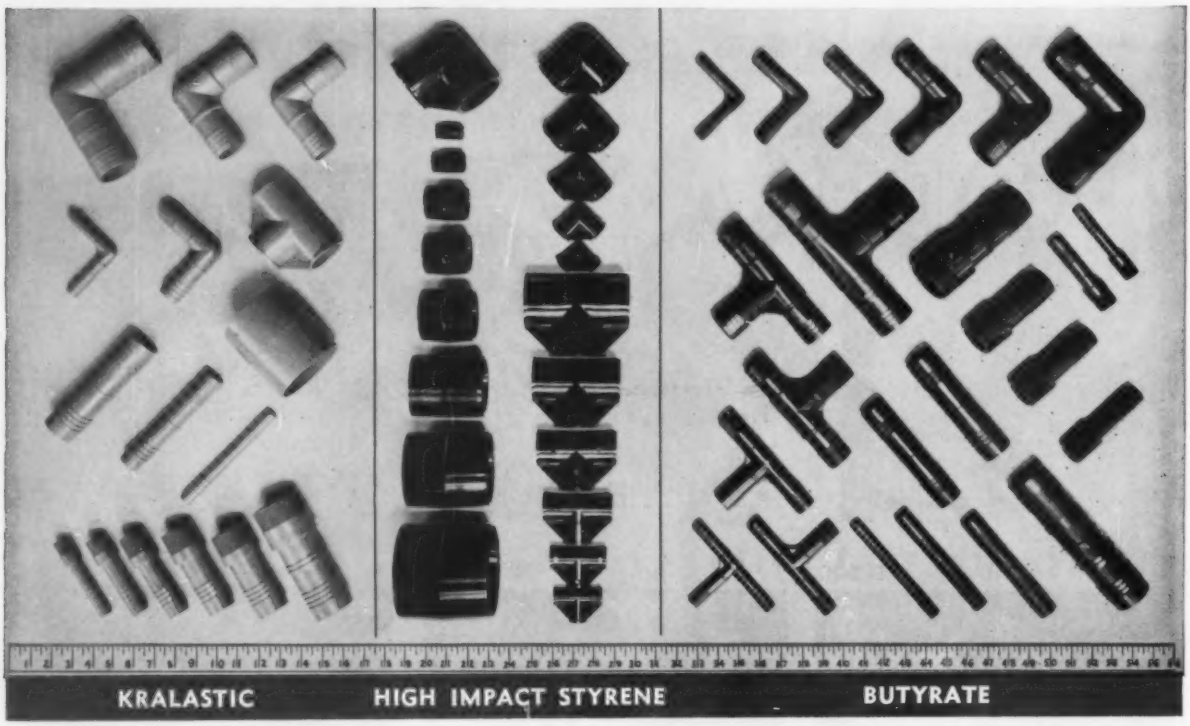
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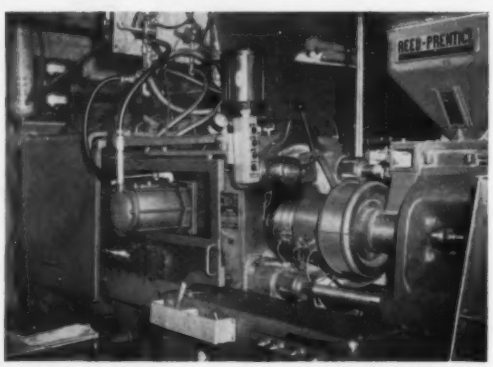


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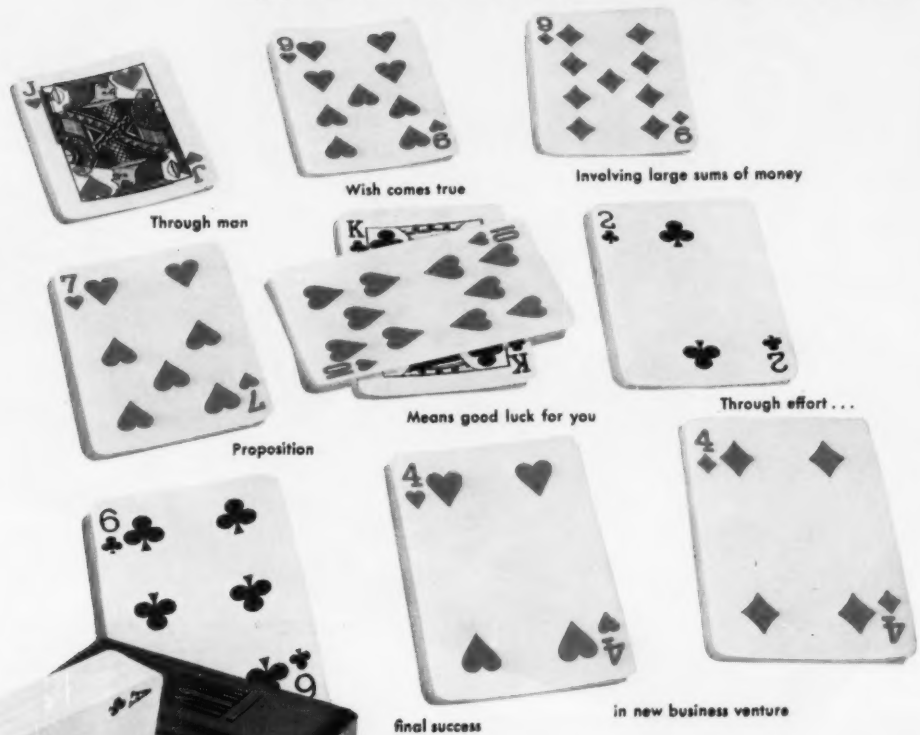
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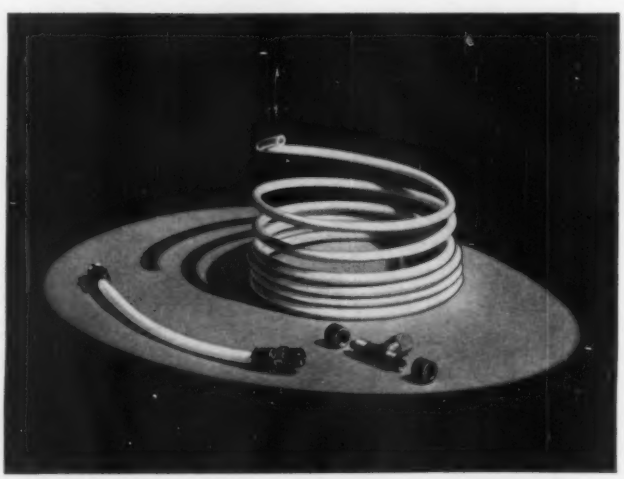
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"ZYTEL"® helps make this doctor's kit lightweight and easy to clean. Resiliency and strength of "Zytel" give good protection to expensive equipment. The new black "Zytel" nylon resin also has outstanding weatherability for outdoor applications.



ALATHON® is used for the body block of this all-purpose pump. Molded "Alathon" has excellent chemical resistance to handle a wide range of corrosive fluids. The pump requires no check valves or gaskets.



TEFLON® offers outstanding resistance to corrosives, biologicals and pharmaceuticals in this flexible thin-walled tubing. The high dielectric strength of "Teflon" also makes the tubing ideal for electrical insulation.

4 more examples of advanced product engineering

HERE ARE FOUR EXAMPLES of creative engineering with the Du Pont family of engineering materials. These applications of Du Pont materials have simplified design, lowered production costs, improved product performance.

"Zytel"* nylon resin was molded to make this practical case for medical instruments. It is lightweight, yet practically unbreakable. The resiliency of "Zytel" helps protect delicate equipment. The case of black "Zytel" resists abrasion and is easy to sterilize and keep clean. By injection molding, pieces are produced that require no finishing operations. (This case is molded by Watertown Manufacturing Company, Watertown, Connecticut, for the National Electric Instrument Co., Elmhurst, New York.)





LUCITE® has excellent clarity and dimensional stability. It can be rapidly molded into intricate shapes. This novel cigarette lighter is light in weight and keeps its smart appearance for years.

"Alathon" polyethylene resin adds much to the performance of this all-purpose pump. The body block molded of "Alathon" resists damaging action of acids, strong oxidizing agents and caustics. Abrasive slurries have little effect on this engineering material. This pump avoids any possibility of external leakage by omitting boxes or shaft seals of any kind. The pump is self-priming and needs no check valves and gaskets. (Manufactured by Vanton Pump and Equipment Corp., New York City.)

"Teflon" tetrafluoroethylene resin is extruded to form this thin-wall, flexible tubing. "Teflon" is non-contaminating and chemically inert to all corrosives except molten alkali metals and fluorine at elevated temperatures and pressures. "Teflon" can be readily positioned due to its flexibility and low coefficient of friction. Its high dielectric strength (400/500 volts/mil.) and a power factor less than .0005 through 10^6 cycles make it ideal for all types of electrical insulation. (Tubing manufactured by the Halogen Insulator and Seal Corporation, Franklin Park, Illinois.)

"Lucite" acrylic resin is used to injection-mold this attractive cigarette lighter. It tells at a glance if you need fluid or flints. Sales appeal is added by the sparkling clarity and lasting beauty of the molded "Lucite." Unaffected by lighter fluid, the body retains its sparkling transparency. (Cigarette lighter is manufactured by the Santay Corp., Chicago, Illinois.)

**"Zytel" is the new trade-mark for Du Pont nylon resin*

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Please send me more information on the Du Pont engineering materials checked: ( ) "Zytel" nylon resin; ( ) "Alathon" polyethylene resin; ( ) "Teflon" tetrafluoroethylene resin; ( ) "Lucite" acrylic resin. I am interested in evaluating these materials for

_____

Name _____ *Position* _____

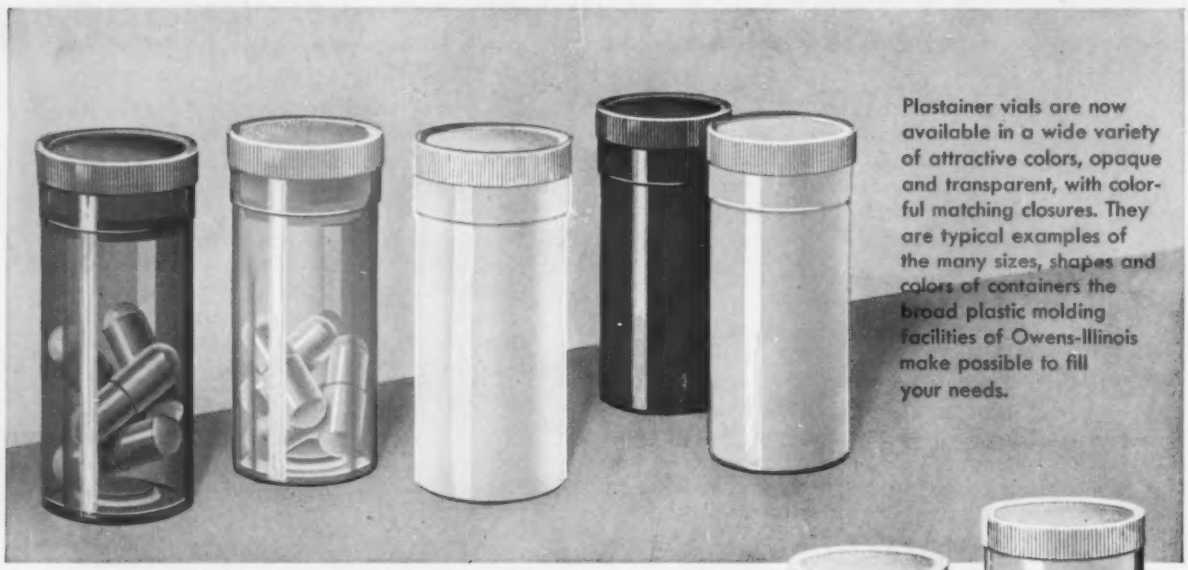
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NEW! Colorful Plastainer Vials BY OWENS-ILLINOIS



Plastainer vials are now available in a wide variety of attractive colors, opaque and transparent, with colorful matching closures. They are typical examples of the many sizes, shapes and colors of containers the broad plastic molding facilities of Owens-Illinois make possible to fill your needs.

You can package anything from candy beads to fishing tackle in Plastainer vials by Owens-Illinois. They protect contents from handling, air and moisture until used. Plastainer vials won't split or crack . . . have wide diameter for easy filling and stable base . . . come in 6 sizes: 3 to 15 drams.



Owens-Illinois packaging know-how and high-quality standards offer you the finest in plastic molding facilities . . . Injection molding . . . Compression molding . . . A complete range in plastics for packaging, for specialties.

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Charlotte . . . . . North Carolina	Jacksonville . . . . . Florida	Omaha . . . . . Nebraska	San Francisco . . . . . California
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A COMPLETE POLYETHYLENE FILM INSTALLATION

New High Speed Takeup Overcomes Many Previous Problems

● The components of MPH's new "packaged unit" for producing flat film and sheeting are matched and integrated. A product of five years of engineering development, they are more efficient and more accurate than any equipment previously available.

With polyethylene, this set-up extrudes film from .001" to .005" in thickness, up to a finished width of 54". Tolerance is much improved, as is essential both for economy and for less difficulty in printing. The same extruder and die extrude cellulose acetate and some formulations of unplasticized PVC. Takeups for those materials in thicknesses from .001" to .015" are also available.

The Extruder

The extruder in the "package" is an MPM 3½", world-famous for its outstanding construction, ease of operation and reliability. For film production the screw has been lengthened and thrust capacity is considerably oversize. MPM's new and exclusive stepless electronic temperature controllers regulate both the cylinder and the manifold type die.

The Polyethylene Takeup

The high speed takeup incorporates an adjustable water bath, pull roll, new efficient roll type trimmers, a unique air propelled cut-off and an automatic change-over from full to empty reels at full speed. The takeup is mounted on rails for easy removal when working on the die.

Like all MPM "packaged units" —for extruding blown film, for covering wire, for extruding rods and other cross sections—this set-up is furnished complete and ready for connection to water and electric lines. Full details supplied on request. Write today.

Demonstrations arranged

West Coast Representative
4113 West Jefferson St., Los Angeles 16, Calif.

modern plastic machinery corp.

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

ELECTRICALLY INTERCHANGEABLE

and it dry blends, too—new PLIOVIC EDB90V

HERE'S electrifying news for wire coverers and other users of vinyl resins in applications where insulative properties are important. It's PLIOVIC EDB90V —the first of Goodyear's new series of electrical grade resins approved on an interchangeability basis.

PLIOVIC EDB90V is a straight polyvinyl chloride resin. But it's tailor-made with three specific aims in mind. The first is to give you a resin of approved electrical quality. The second is to give you a resin that is truly easy to extrude using a dry blend process. The third is to give you both these advantages with no sacrifice in physical properties.

PLIOVIC EDB90V easily passes the tests required by Underwriters' Laboratories, Inc., including the T and TW Building Wire Specifications and the 80°C. and 105°C. Appliance Wire Specifications. It is fully interchangeable with all other approved electrical grade vinyl resins. It dry blends readily into a smooth, free-flowing mix. It extrudes and calenders well. And it possesses excellent physical properties.

The primary reason for the unique combination of properties in PLIOVIC EDB90V is careful polymerization. Particular attention is paid to the close control of molecular weight and particle size, shape and distribution. Extra effort also is exerted to eliminate impurities. This is the same care and control that characterize the production of all PLIOVIC resins, developed to a much finer degree.

PLIOVIC EDB90V is new, but not untried. It has been fully proved—and approved —in exhaustive tests and trial plant runs. Why not prove it in your plant? Samples and top technical help on it and other new, electrical grade resins are yours by writing to:

Goodyear, Chemical Division, Akron 16, Ohio

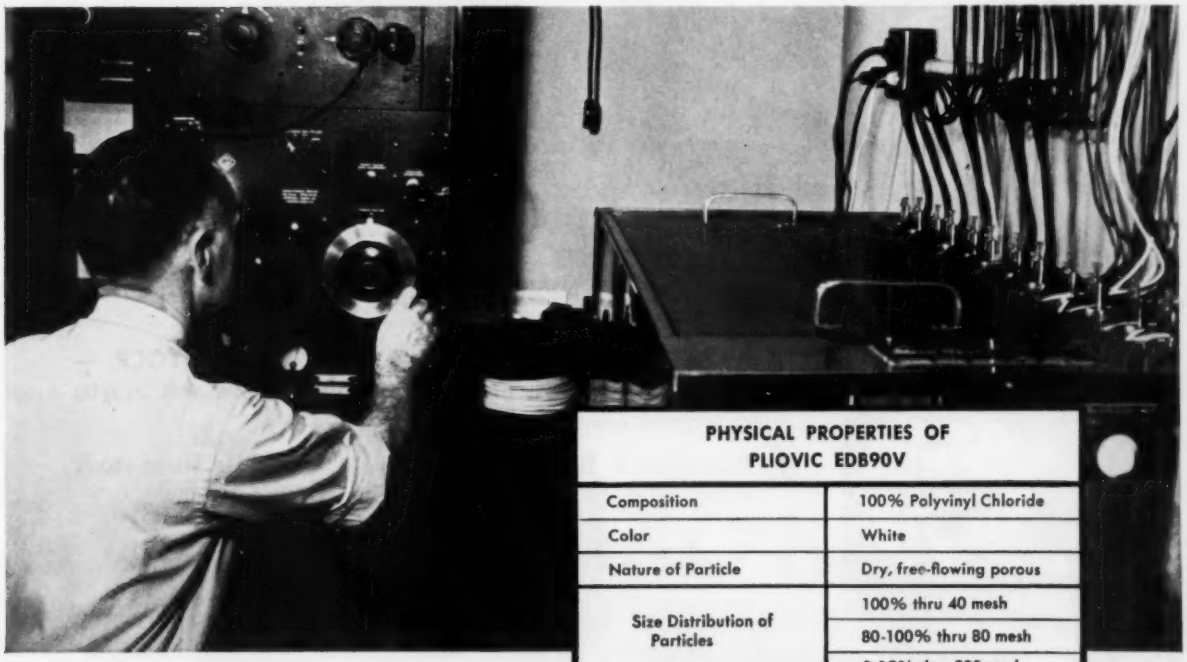
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Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry



PLIOVIC EDB90V successfully passed rigorous tests such as these – Insulation Resistance Test (above) and Dielectric Constant Test (below)–to be declared fully interchangeable with all other approved, electrical grade, vinyl resins by Underwriters' Laboratories, Inc.



PHYSICAL PROPERTIES OF PLIOVIC EDB90V

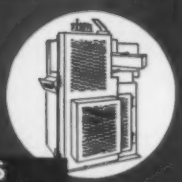
Composition	100% Polyvinyl Chloride
Color	White
Nature of Particle	Dry, free-flowing porous
Size Distribution of Particles	100% thru 40 mesh
	80-100% thru 80 mesh
	0-15% thru 200 mesh
Intrinsic Viscosity	0.90 Av.
Specific Gravity	1.40 Av.
Bulk Density	38 lbs./cu. ft. av.
Volume Resistivity	$2x10^{13}$ ohm centimeters (av.)

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every other Sunday–NBC TV Network

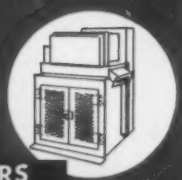
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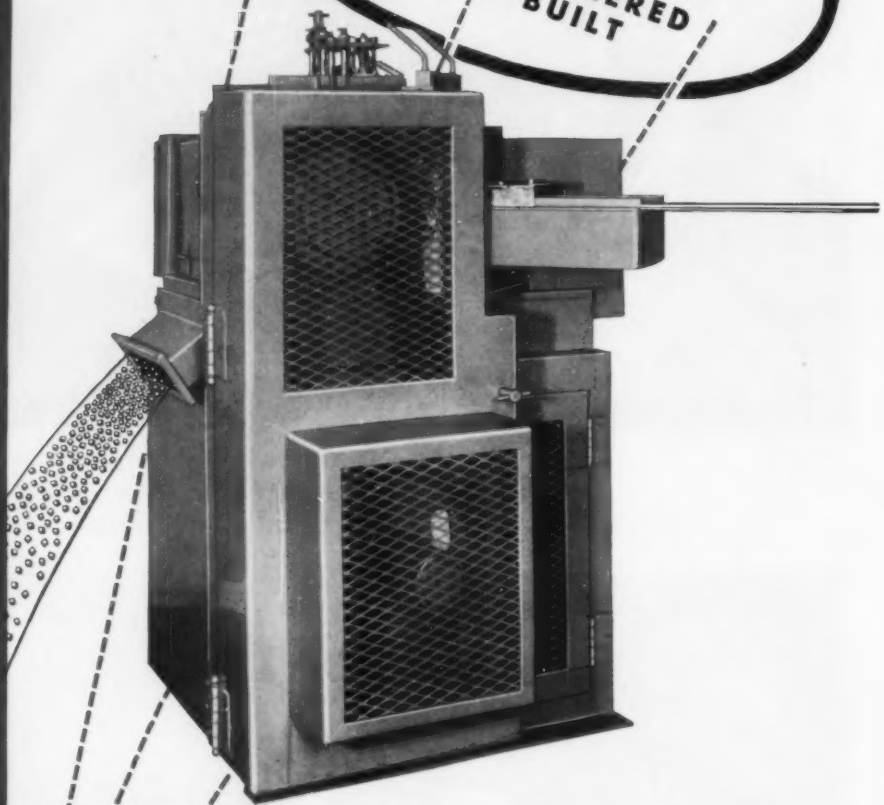
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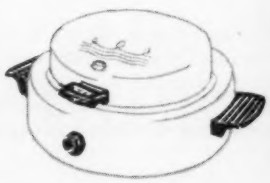
The handle's your customer's first contact with your product. Many times the sale can be made—or lost—at this crucial moment. Your designers know how to design sales appeal into a handle. Help them hold on to their design by bringing it to Kurz-Kasch.

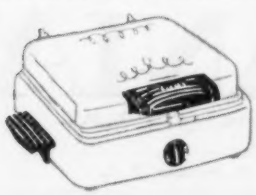
Dominion Electric Corporation does. Over the past few years, Dominion has repeatedly turned to Kurz-Kasch for their custom phenolic handles. From coffeemakers to wafflebakers and sandwich grills, Dominion found K-K engineers able, ready and willing to engineer and mould phenolic handles—light, low cost, with heat insulation aplenty and lots of sales appeal!

To boost your sales appeal, let Kurz-Kasch "handle" your product. Write, wire or phone today for more complete information concerning K-K *custom* moulding.

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with New Process

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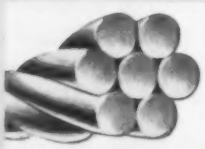
SMALL NUMBER OF STRANDS (LARGE DIAMETER)



Diameter Reduction Normal (Good Life)

GREAT NUMBER OF STRANDS (SMALL DIAMETER)

Diameter Reduction Excessive (Short Life)



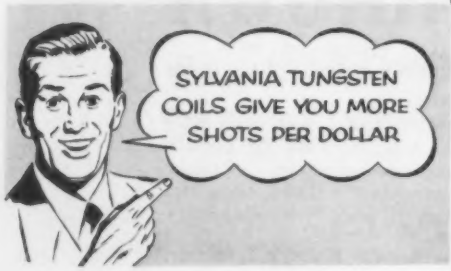
This drawing of 3 and 7 strand wire shows the relative cross-sections under similar conditions. The wires of the larger cross-section give the better performance.

(Initial Cross-Sections Equal)

EVERY step in the manufacture of *new process* Sylvania tungsten from ore to wire is performed in Sylvania's own plants where quality is rigidly controlled. The wire, in either single or multi-strands, is then coiled specifically for high vacuum metalizing. This unique quality control results in tungsten coils that last longer and give far more efficient service.

Sylvania offers a wide variety of new process tungsten coils and wire diameters. Sylvania research, however, has established that a small number of relatively large diameter wires are the most effective and economical type of strand for most types of vacuum metalizing. Sylvania's strand avoids early failures due to rapid diameter reduction inherent in strand made from small size wires. It saves you money, insures a better quality metalized product.

Whatever your vacuum metalizing application, there's a new process Sylvania tungsten coil to do a better job. Or, if you form your own coils, new process Sylvania tungsten wire is yours in a full range of diameters, in stranded cable or single strand. And, if you have any special application problems, Sylvania engineers will be glad to help you work them out.

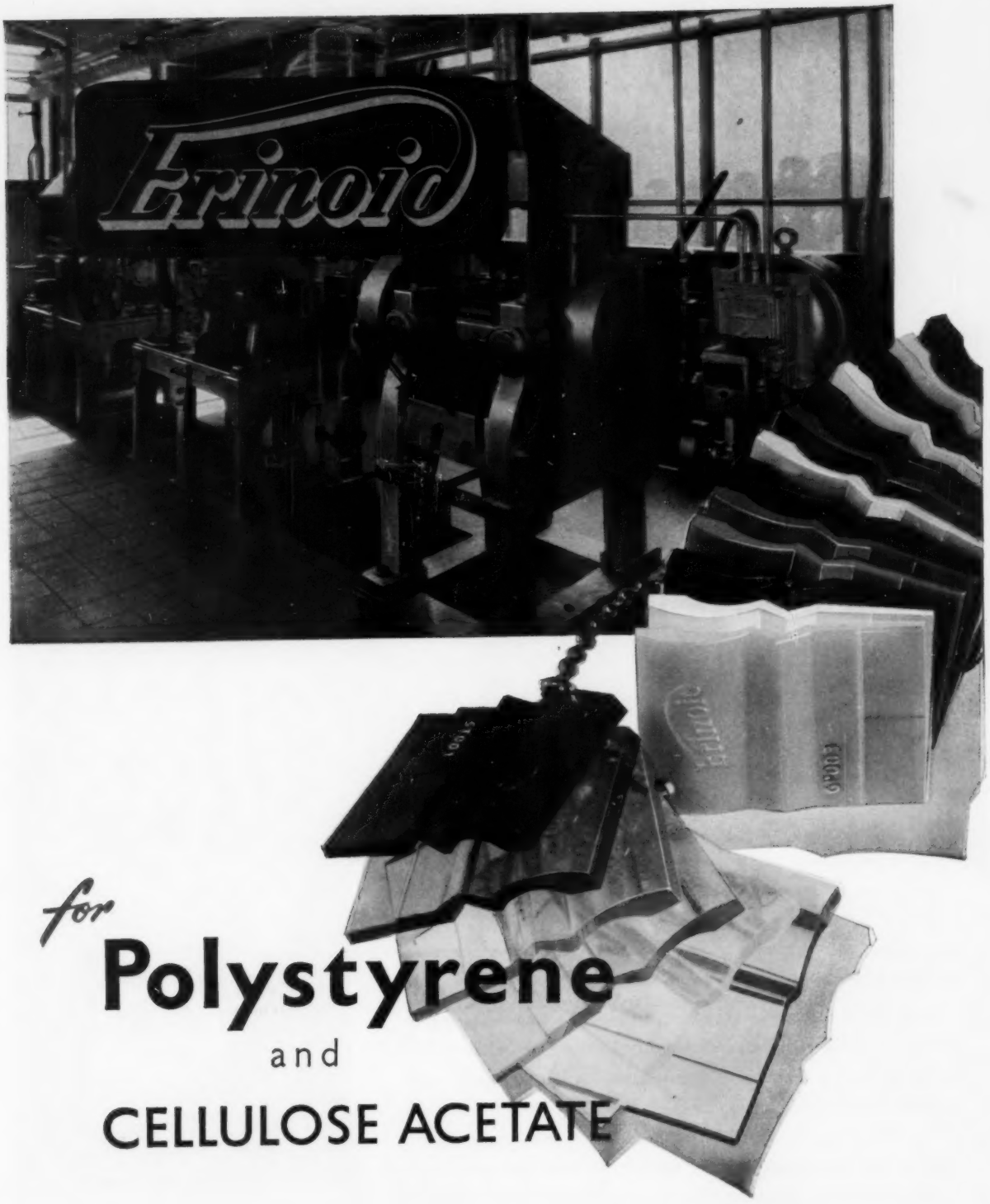


SYLVANIA

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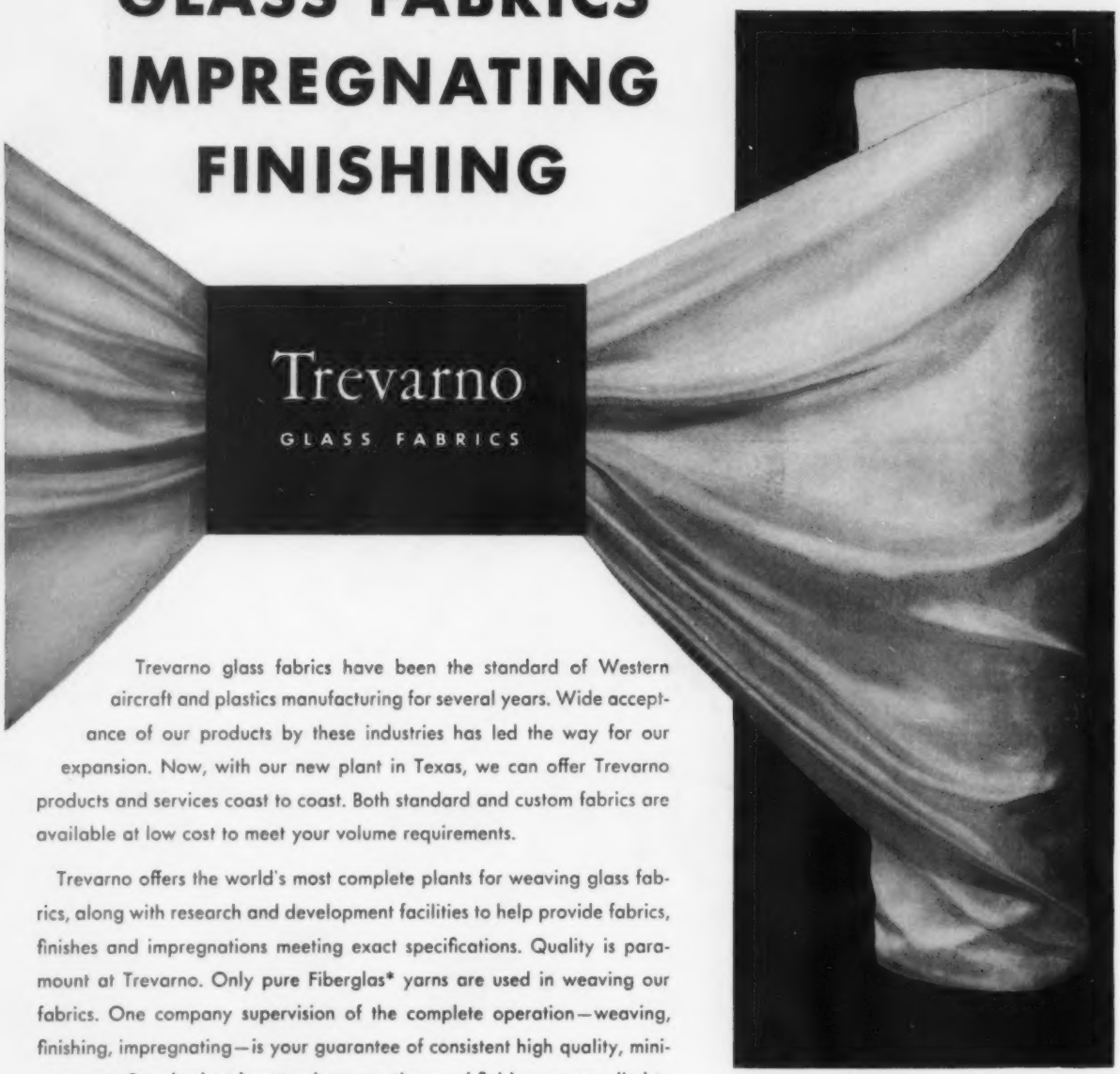
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Trevarno offers the world's most complete plants for weaving glass fabrics, along with research and development facilities to help provide fabrics, finishes and impregnations meeting exact specifications. Quality is paramount at Trevarno. Only pure Fiberglas* yarns are used in weaving our fabrics. One company supervision of the complete operation—weaving, finishing, impregnating—is your guarantee of consistent high quality, minimum cost. Standard and custom impregnations and finishes are supplied to precision specifications; fabrics are woven to your exact requirements.

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Molding Holes is EASY with an H-P-M

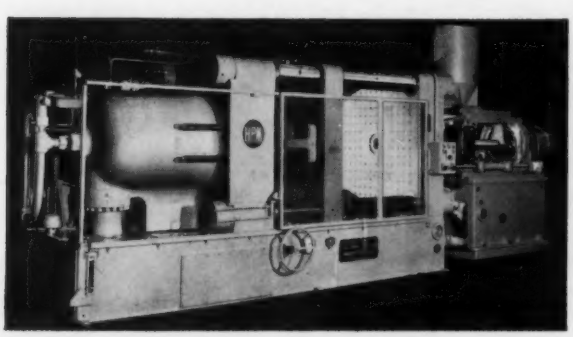


An H-P-M 60 oz. plastics injection machine molding fluorescent light louvers at Service Plastics, Inc., Chicago, for the Bernard Edward Company.

Take it from the honey bee . . . molding holes IS easy . . . *if you have the proper equipment.* And, the proper equipment for molding fluorescent light louvers is this big H-P-M.

Count 'em — 1005 clean, precise ⅜" square windows for better light. This spectacular example of precision molding is 11½" wide, 48" long and 17/32" deep. It has an .075 inch wall thickness, weighs 40 ounces and is molded from general purpose Polystyrene . . . another tough molding job made easy with an H-P-M 60 ounce machine.

Now, H-P-M is offering this machine with even greater injection and plasticizing capacities. This new model is rated as a full 80 ounce machine. It has H-P-M's new, larger, more efficient injection assembly, including weigh feeding, and retains the all-hydraulic 1200-ton mold clamp, 60" daylight, 36" stroke, 48"x60" mold area and other proven, big-machine features. Get full details on H-P-M's new "80" . . . write for bulletin #5406 today!



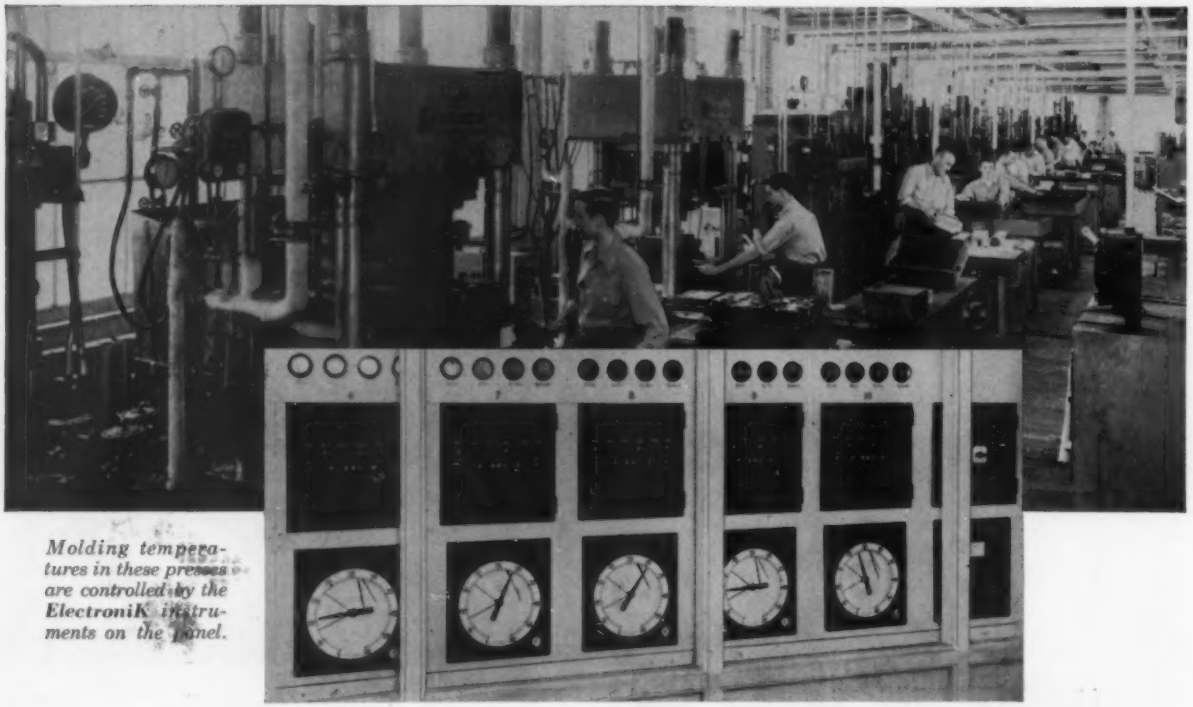
HPM

THE HYDRAULIC PRESS MFG. CO.

1010 Marion Road, Mount Gilead, Ohio, U. S. A.

Presses for Every Pressure Processing Application

Reject rate slashed– *through ElectroniK control* of molding temperature



Molding temperatures in these presses are controlled by the ElectroniK instruments on the panel.

BY SWITCHING from conventional time-cycle regulation to precise *ElectroniK* control of die temperatures, The National Cash Register Co. has given their molding machines a sizable boost in productivity.

Key tips for National equipment, molded of cellulose acetate butyrate in 21 different colors, now come out of the dies with such excellent uniformity of lamination that the reject rate has dropped nearly to zero. Machine stoppages to determine causes of excessive rejects have been materially reduced. The *ElectroniK* charts save trouble-shooting time, by pointing out trends in machine operation. And these charts give management a ready index to machine productivity, because they show clearly every press cycle for the day's work.

A pencil type thermocouple inserted in the upper die of each press detects temperature right next to the die cavities. Connected to the couple is an *ElectroniK* instrument which records die temperature and through its pneumatic control system, regulates steam to the dies to hold constant temperature throughout the preheat cycle. The instrument automatically energizes a cycle timer when the specified molding temperature is reached. Precise, fully automatic control is thus maintained over both the cycle time and molding temperature.

A wide variety of Brown instruments are supplied for the requirements of different types of molding machines. Whatever your control problem, your nearby Honeywell sales engineer can give you valuable assistance . . . and he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA: Write for Catalog 1531, "*ElectroniK* Controllers."**

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

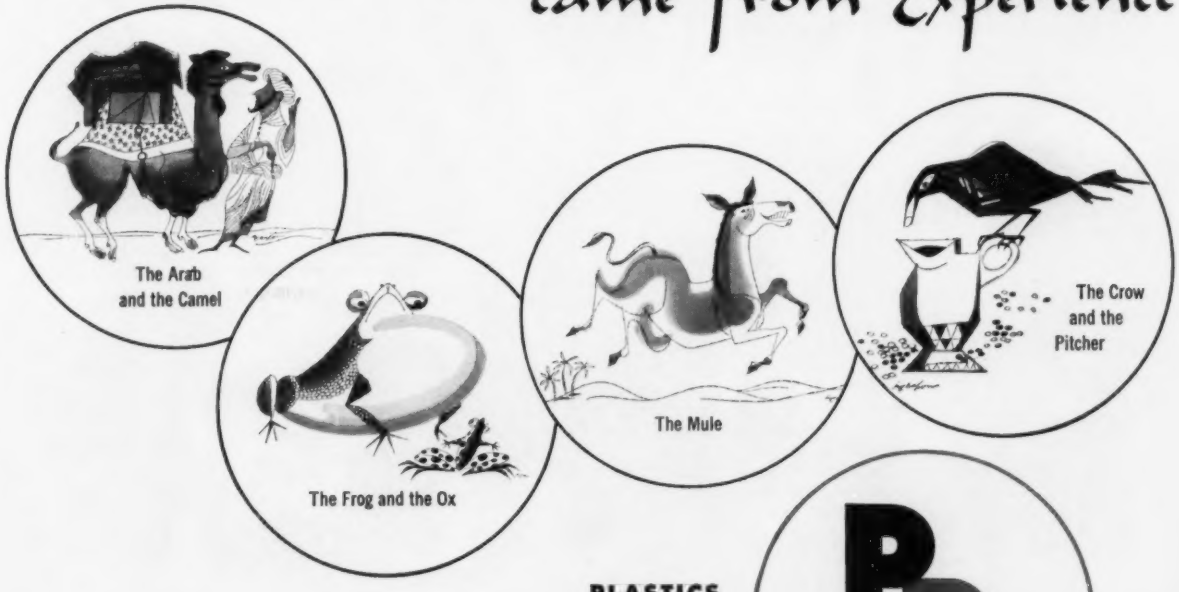
First in Controls



Aesop was supposedly a Greek slave who had been bought and sold several times. It was in the course of his travels, the various predicaments in which he found himself and his reactions to them, that he gained the reputation for having great wisdom and a mighty wit. His fables, which were unrecorded, were handed down by word of mouth from generation to generation — thus gaining him immortality. Such is the legend of Aesop.

Plenco, long a leading supplier of a wide range of quality controlled phenolics to the plastics industry, places their great experience and engineering wisdom at your disposal to help you solve your most complex problems.

Aesop: his Wisdom came from Experience



PLASTICS ENGINEERING COMPANY
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FULLY AUTOMATIC PRODUCTION NOW IS POSSIBLE WITH THE IMPROVED LEWIS "4". New and extremely sensitive low-pressure closing controls provide absolute safety for molds and operators . . . permit "hands off" production. These new controls feature infinitely variable adjustment and allow machine to close at normal speed with very low hydraulic pressure. If no obstruction is encountered when the moving platen reaches pre-set point, final high-pressure close is effected instantly and automatically. When moving platen meets slightest resistance in closing, the machine stops immediately and activates a warning bell and light.

The LEWIS "4" handles almost any plastics material . . . will mold intricate 2 to 3-ounce large area parts originally produced on 8-ounce equipment. Small and sturdily constructed, Model "4" provides multiple shot injection and fast operation for high production with minimum scrap and maintenance.

Write for BULLETIN 101 for additional details.



8711-LW

THE LEWIS "4" INJECTION MOLDING MACHINE



LEWIS

THE LEWIS WELDING & ENGINEERING CORPORATION
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Public acceptance of Emerson Radio and Phonograph Corporation's engineering miracle, the "Pocket Radio," has been nothing short of spectacular. This world's smallest personal portable, measuring only six inches in width by one and a quarter inches in depth and weighing less than one pound, is housed in a striking impact styrene case, injection molded by Ideal Plastics.

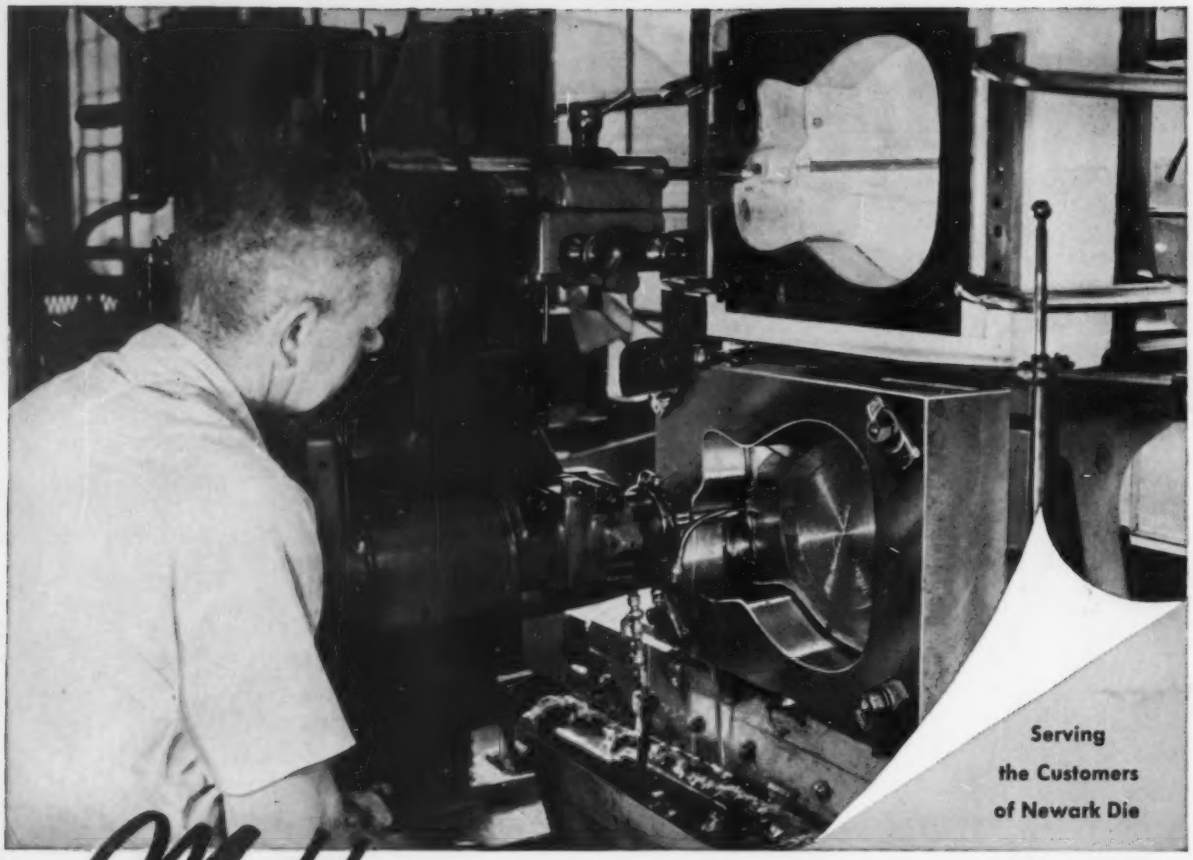
Not only was Ideal able to provide the cases and other molded components needed initially, but now that consumer demand has really started snow-balling, our vast custom injection molding facilities are proving equal to every demand for more and faster production.

It is typical for critical purchasers with large requirements to call on Ideal to fill their needs for molded plastics. You will find that we handle every aspect of your custom injection molding in a manner and at a price which will please you.

For a prompt estimate, contact A. C. Manovill, Vice President in Charge of Sales. Ideal Plastics Corporation, 184-10 Jamaica Avenue, Hollis 7, N. Y. Phone: AXtel 7-7000. Midwest Representative, Steel Mill Products Co., 176 West Adams St., Chicago 3, Ill. Phone: CEntral 6-5136.

Better Molded Plastics for Industry & Home

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the Customers
of Newark Die

Molds ACCURATELY DUPLICATED FROM MASTER PATTERNS ON DIE SINKING MACHINES

In Keller machines like the one shown—one of a battery in use at Newark Die—a tracer passing over a master pattern automatically controls the movements of the feeding mechanism, which in turn governs the cutting of the mold.

Because of the delicacy of this electrical control when used by the skilled craftsmen at Newark Die, the finest of work can be done on the largest of molds.

Keller die sinking machines are typical of the many types of up-to-the-minute equipment now turning out molds to serve the customers of Newark Die.

Write for free booklet "SOLVING BIG MOLD PROBLEMS"

NEWARK DIE COMPANY

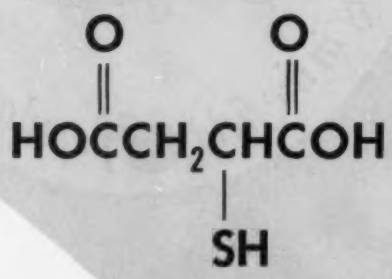
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Still Another *National Aniline* Dicarboxylic Acid With an Important Potential in Resins, Plasticizers and Rubber

THIOMALIC ACID

(Mercaptosuccinic Acid)

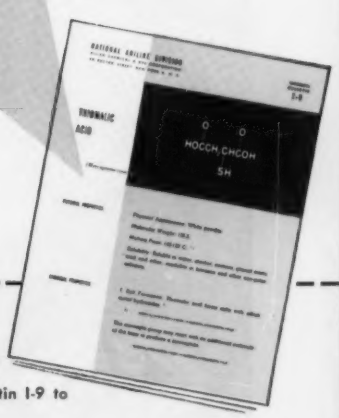


Thiomalic Acid is unique as the only commercially available dicarboxylic acid containing a reactive mercapto group as well as two carboxyl groups. With its three functional groups and the resulting possibilities for cross linkage, Thiomalic Acid should appeal to those engaged in resin, plasticizer and rubber research. This interesting chemical also should find application in pharmaceuticals and dyestuffs.

Thiomalic Acid is one of a growing group of dicarboxylic acids and anhydrides developed by National Aniline as an outgrowth of our leading position in this area of organic chemical development. Research samples are immediately available. Larger quantities for semiplant studies can be supplied.

Send for Technical Bulletin I-9

This six-page bulletin contains comprehensive physical properties, chemical properties, suggested uses and a basic bibliography of literature references as a starting point for your own work with this potentially-important intermediate. A copy will be sent without cost or obligation. The coupon below is for your convenience.



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TOO LARGE . . . . .

TOO COMPLICATED



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- FINISHING

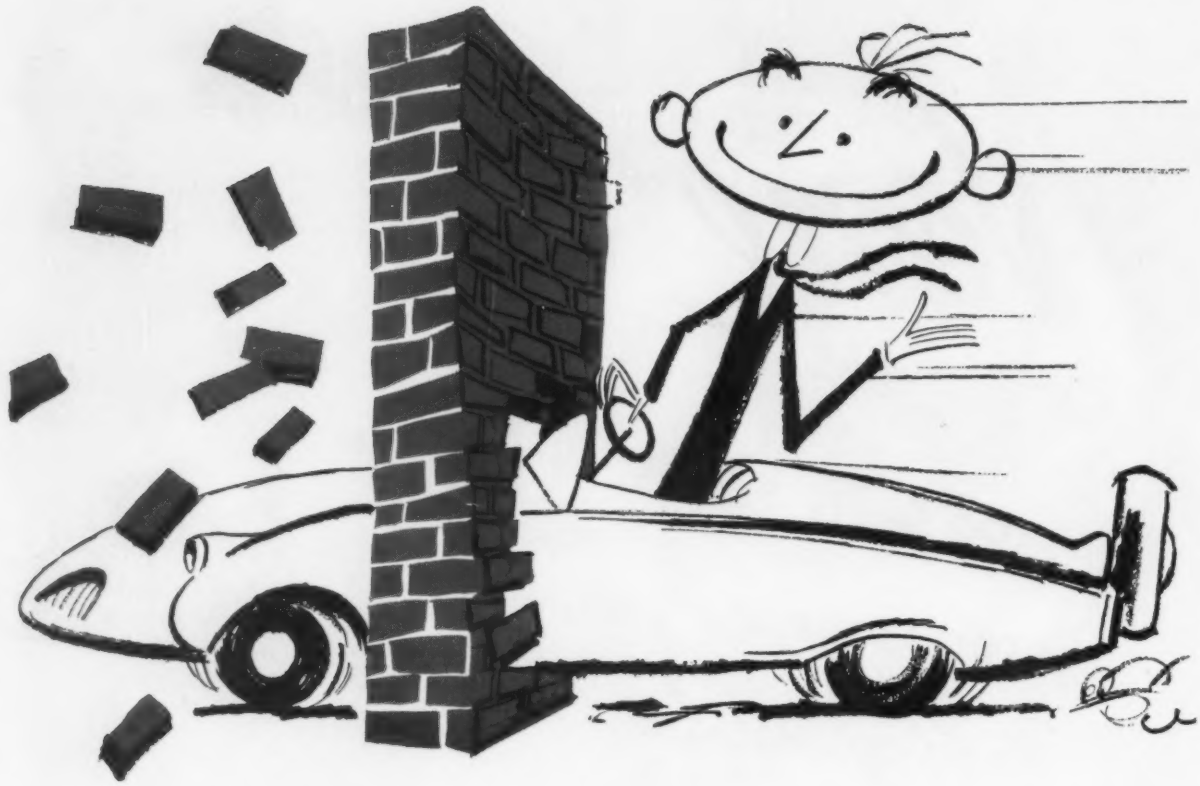
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How to get **Better Polyesters** at Low Cost

Can you mold a glass reinforced polyester that's strong enough to push over a brick wall and inexpensive enough to compete in the auto body market? Perhaps not today. But someday you may be called on to meet specifications almost that tough. And when you are, you'll probably be relying on a DIAMOND ALKALI Calcium Carbonate as a filler to help you get smoother surfaces, decreased shrinkage, improved wet strength and *lower cost*.

If you are not familiar with the DIAMOND's tailor-made precipitated calcium carbonates, here are brief descriptions:

Suspenso®—particle size about 5 microns.

Surfex®MM—Same as Suspenso, coated with 1% resin.

Multifex®MM—Uncoated, particle size about .06 microns.

Kalite®—Size about 1 micron, coated with 1% stearic acid.

For more information, specific formula suggestions and technical assistance, call your nearest DIAMOND Sales Office or write DIAMOND ALKALI Co., 300 Union Commerce Bldg., Cleveland 14, Ohio.

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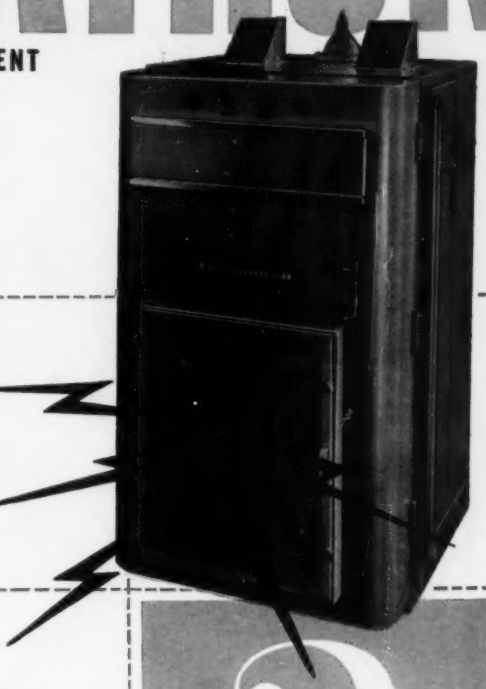
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HIGH FREQUENCY SEALING AND HEATING EQUIPMENT

reaching out to more and more industries... *Let it give your production a helping hand!*



plastic sealing	glue drying	
reinforced fibre glass curing and assembly	plastisol curing	your new application



THERMATRON high frequency started with the sealing of belts, bags and other small items... moved on to larger products such as wading pools and outerwear . . . and now reaches out to embrace *all* phases of plastic production! Latest developments include the curing of plastisols and reinforced fibre glass.

THERMATRON can give your production a helping hand too! If you're in any phase of plastic fabrication, low cost, high speed THERMATRON electronic equipment can *heat, cure, dry* or *weld* faster and cheaper than any other method.

THERMATRON is so versatile it's hard to pinpoint every use. Some applications seemed impossible until our engineers went to work on them. The best way to find out how high frequency fits into *your* production is to let us run tests on your own material and offer sound recommendations . . . all without obligation, of course. Write today for bulletin no. 88.

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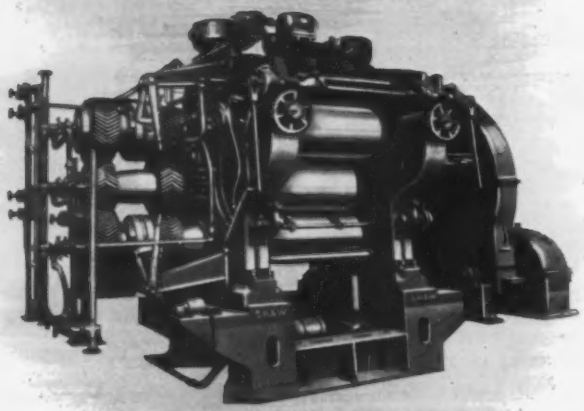
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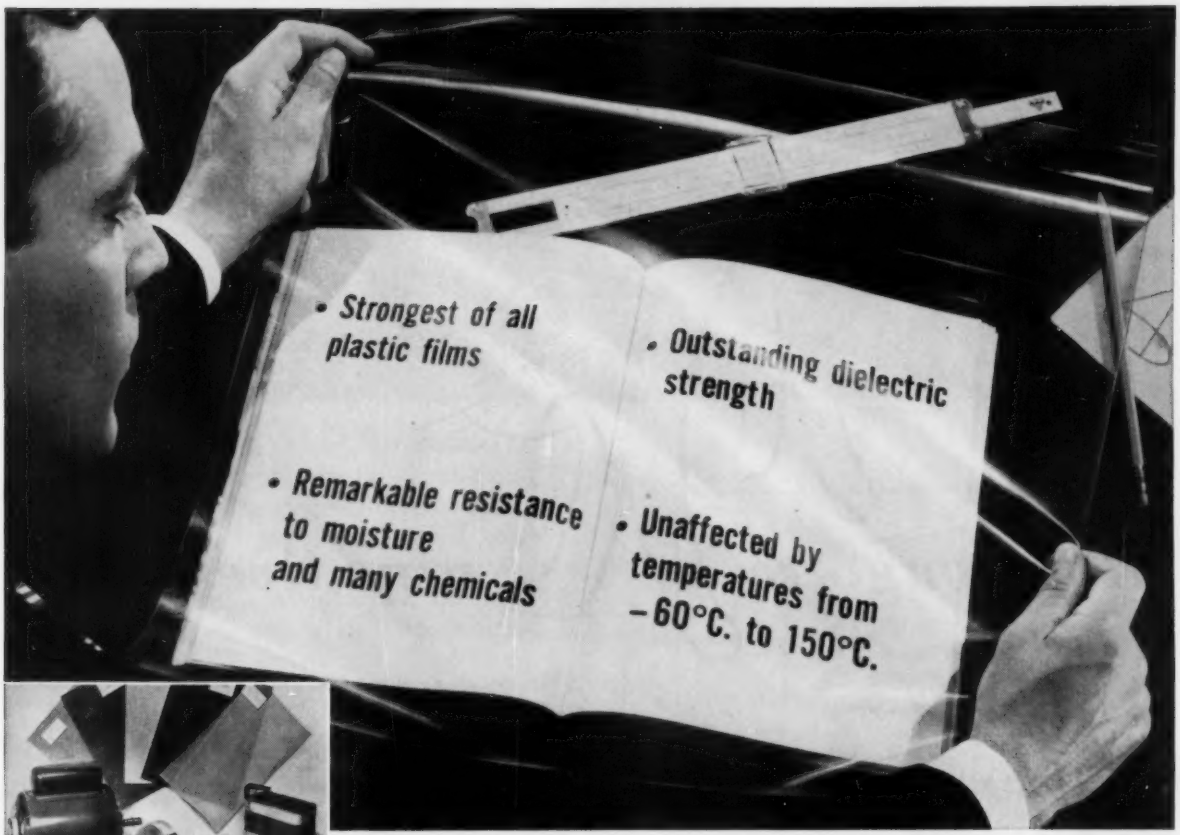
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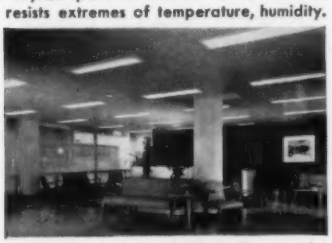
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New Du Pont **MYLAR** has unusual properties that may help you improve a product

REG. U.S. PAT. OFF.



The balance of properties offered by "Mylar" permits thinner insulation that resists extremes of temperature, humidity.



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High tensile strength and dimensional stability of "Mylar" make it useful for magnetic recording and industrial tapes.

Du Pont "Mylar"—strongest of all plastic films—offers you new possibilities of product improvement in fields as far apart as electrical capacitors and high-fashion fabrics. "Mylar" polyester film, a new product of Du Pont research, has an unusual balance of electrical, physical, chemical and thermal properties.

Its high dielectric strength and relatively low power factor, together with outstanding mechanical properties and thermal stability, make it ideal for a variety of insulating purposes.

DU PONT "MYLAR"

polyester film

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BETTER THINGS FOR BETTER LIVING
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At the left are shown a few examples of the varied applications of this versatile film. It may pay you to investigate the opportunities for better products . . . lower costs . . . that "Mylar" holds for you.

Send for free booklet. To help you evaluate the advantages of "Mylar" for your product, this free booklet gives you property data on "Mylar". . . shows you how this film can be used in product design and improvement.



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Please send me more information about Du Pont "Mylar."

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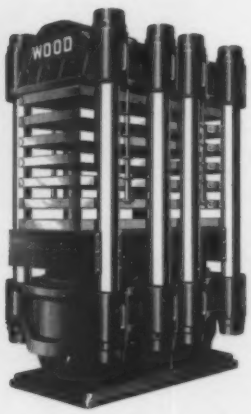
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How long are nine lives?



IN RUBBER AND PLASTICS, THE PAYOFF'S AT AN R. D. WOOD PRESS LIKE THIS ONE!

This 1,327-ton multiple-opening hydraulic press is used for the manufacture of molded brake lining and similar products. Can be furnished in various sizes and capacities to meet production needs. R. D. Wood presses are made for use in many industries. Ask for catalog, and for engineering aid—both yours without obligation.

The amazing ability of cats to survive what might be called "punishing service conditions" has given rise to the 9-life theory. How long a period this is nobody really knows. That's the way it is with R. D. Wood hydraulic presses . . . their life seems limitless, too. Some of them are scarcely beginning to draw their second wind after 25 years in service. Others are still going strong at 50. What every owner knows for certain about his R. D. Wood presses is that they have no trouble outliving the time needed to earn the original investment . . . and then some. An informative catalog is available.

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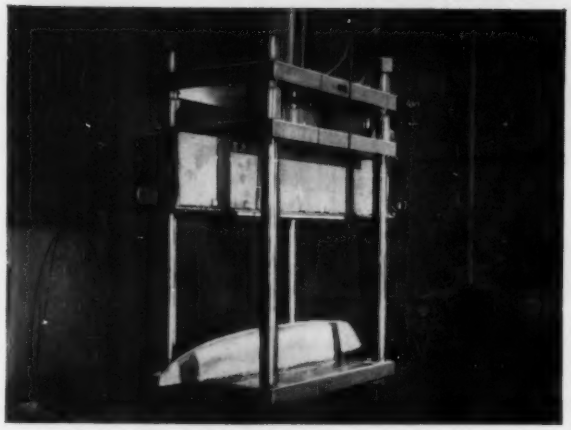

CAST-IRON PIPE


GATE VALVES


GAS PRODUCERS


ACCUMULATORS

users report big savings with sprayed metal tooling





Photos courtesy Narmco Mfg. Co., San Diego, Cal.

Typical glass laminated part produced from sprayed metal tooling in press shown. Match molds for this jet aircraft wing tip were built up with alternating layers of sprayed aluminum and bronze over sprayed zinc base and backed with copper tubing, reinforced and insulated with laminated glass cloth. Tubing carries steam for cure, after which cold water is used to chill male for next layup.



new bulletin provides data round-up on current successful applications

Reports from users of sprayed metal tooling on recent successful applications form the basis for a new data bulletin, now available without charge. These case histories demonstrate the substantial savings in time and money over other tooling methods, point up possible pitfalls that can be avoided in tool design and fabrication.



Data covers general procedures, describes and illustrates tooling now in use and plastic production parts. Write for a copy of this new data bulletin, or use the handy coupon below.

DON A. WATSON
METALLIZING ENGINEERING CO., INC.
1119 Prospect Ave., Westbury, Long Island, N. Y.

Please send me free copy of Bulletin 111 — Sprayed Metal Tooling. No obligation of course.

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Playing "Pin the Tail on the Molding"

Whenever we go shopping—the Mrs. usually manages to drag us along—we are always amazed to discover products which have been molded of the wrong plastic material.

Boonton has always abided by the fact that certain plastics simply weren't suited for certain applications. But unfortunately there are still penny-wise, pound-foolish individuals who take a short-sighted "Let's save a couple of cents" attitude and use the cheapest material, regardless of how ineligible it actually is for their purpose.

Getting away with choosing plastics by playing "Pin the Tail on the Molding" is impossible. Sooner or later the customers wise-up. Every molding job must be analyzed carefully and its intended use balanced against the characteristics of the various plastics available.

Helpful guidance in selecting the proper plastic resins has helped Boonton build a reputation as a fine custom molder. Naturally, our skill at mold-design, molding and finishing has contributed materially, too. We don't profess to know all the answers—no molder could—but we have thirty years' experience in plastics molding and that certainly will help us help you.

You can watch your mold run at . . .

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BOONTON, NEW JERSEY

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INCREASE YOUR PROFITS
Upgrade Vinyls
with MONSANTO PLASTICIZERS!

Monsanto Standard Plasticizers

DOP (di-2-ethylhexyl phthalate) . . .
the most widely used plasticizer in the vinyl industry. A dependable standard for sheeting, free film, vinyl dispersions, and extrusion formulations.

DIOP (diisooctyl phthalate) . . .
Similar to DOP with superior plastisol dispersion characteristics. Excellent for film, sheeting, and vinyl dispersions.

DOA (di-2-ethylhexyl adipate) . . .
Possesses excellent low-temperature flexibility, below −65°C. Has low viscosity in plastisols. Widely used in garden hose, free film, sheeting, plastisols, organisols and extrusions.

Tricresyl phosphate . . . .
Gives a rapid fusing action and has high resistance to staining, oils and greases. Possesses excellent flame-retarding properties. Tricresyl phosphate is widely used in vinyl wire insulation, floor tile, and in free film and sheeting to provide flame retardency.

New Monsanto Plasticizers

DIDP (diisodecyl phthalate) . . .
Ideal wherever low volatility and efficiency are needed. Can be used in electrical insulation, film and sheeting, floor tile and other applications.

DNODP (di-n-octyl, n-decyl phthalate)
can upgrade vinyl by increasing their flexibility and lowering volatility. This plasticizer imparts good resistance to soapy and boiling water.

DIDA (diisodecyl adipate) . . .
less volatile plasticizer than DOA. Imparts excellent low-temperature flexibility and offers improved garden hose, upholstery stock, film and sheeting, coated fabrics, and vinyl dispersions.

Santicizer 140 (cresyl diphenyl phosphate) and Santicizer 141 (alkyl diaryl phosphate) . . .
both compounds impart flame retardency, good grease, oil and stain resistance. These plasticizers have good low-temperature flexibility and excellent light stability. Widely used in film and sheeting, and excellent for increasing fusion rate of vinyl dispersions and extrusions.

Santicizer: Reg. U. S. Pat. Off.

For more information: write Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478, St. Louis 1, Missouri.

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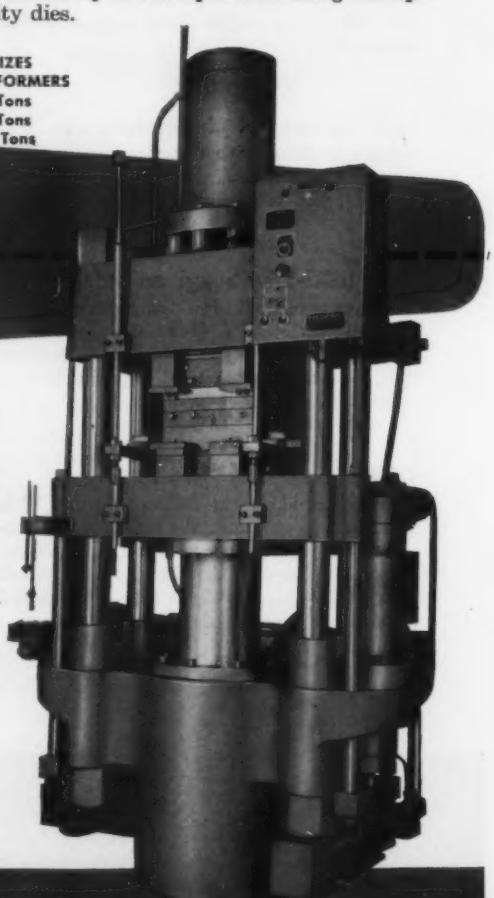
NEW ALL HYDRAULIC Preformer



Horizontal design permits gravity discharge, minimizing breakage and damage to preforms. It also makes possible automatic preforming of impact type materials rapidly and accurately. Operation is practically dust free. Rods and guides are fully enclosed. Makes up to 25 sq. in. per shot or up to 7200 per hour using multiple cavity dies.

3 SIZES OF PREFORMERS
45 Tons
85 Tons
125 Tons

CUSTOM ENGINEERED HYDRAULIC Presses



Fast low cost production follows the selection of a Logan Hydraulic Press. In the new line of Logan Presses are a wide choice of self-contained hydraulic, fast traverse governed pressures with up or down stroke, top or bottom transfer and with semi-automatic precise controls as well as other features that will shrink your production costs. Complete range is from 10 to 300 tons.

Write for complete data on Logan equipment before you buy.

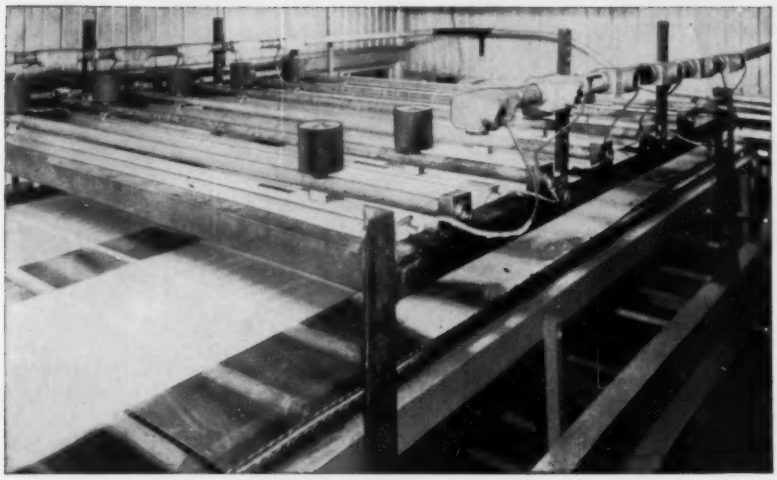
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CHROMALOX

PROFITABLE IDEAS FOR PLASTIC PROCESSING

Production TIPS



VINYL SHEETS DEHYDRATED AT 22 FT. PER SECOND WITH CONVEYORIZED RADIANT HEATING SYSTEM

While heat, pressure and moisture are often combined in many processing operations, they are a bad team when it comes to laminating a sheet of vinyl between two sheets of glass to make safety glass. In fabricating safety glass the vinyl sheeting must be perfectly dry at the bonding stage to assure cleanness and clearness of the glass throughout its useful life.

That's where Chromalox Radiant Panels enter the picture!

After cleaning and rinsing the vinyl sheets, one large safety glass manufacturer found a ready solution to the problem of moisture by installing a bank of six Chromalox Radiant Heaters to remove excess moisture contents from the sheeting. The heaters were mounted on an angle iron frame above a conveyor belt travelling at 22 feet per minute. The radiant heaters spread an intense blanket of uniform heat across the width of the sheets to reduce moisture content to a very safe one-half of one per cent at the time of lamination.

Bonding failures due to moisture are now eliminated; and the high absorption of the far-infrared heat by the sheeting has increased the drying rate over the former and less efficient method. Too, the compact design of the Chromalox Radiant Heater installation saves floor space and is easily adapted to conveyorized production.

Chromalox Application Report No. R-121 covers this interesting application in detail. Send for it today. The report may suggest ways you can improve production and cut rejects in your own operations with Chromalox Radiant Heaters.

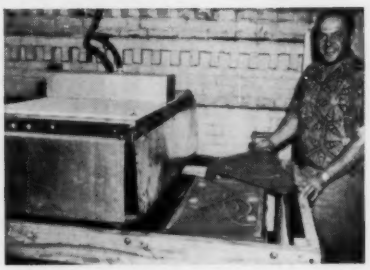
READY REFERENCE GUIDE



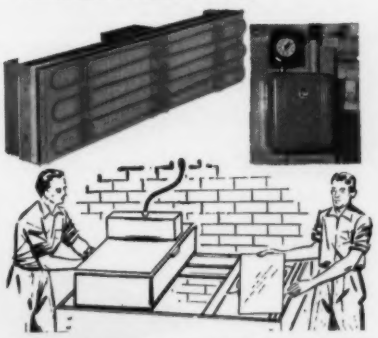
TO CHROMALOX APPLICATIONS IN PLASTICS PROCESSING

Here's a 24-page handbook that shows actual case studies of how Chromalox electric heaters of all types are cutting costs and increasing output in the plastics field. You'll find the handbook interesting and informative. And perhaps you'll also find a solution to a particularly perplexing heating problem now confronting you. Check coupon for your copy of application guide.

VACUUM FORMING FOR A SMALL INVESTMENT



For a relatively small outlay of capital, companies forming plastic sheets by the vacuum process can construct their own molding machines. The secret is in the Chromalox Radiant Panel which is the heating component of the equipment. Radiant panels provide far-infrared radiation that's ideal for uniformly heating plastics of all colors (even white and transparent) prior to vacuum forming. The heat output is adjustable for precisely heating sheets of varying gauges. Vinyl, styrene, cellulose acetate, polystyrene and butyrate have all been successfully vacuum formed by using Chromalox Radiant Panels.



Chromalox Radiant Panel rolls back and forth over two work positions. Input controller adjusts heat to sheet thickness. Cycle ranges from 10 to 60 seconds.

EDWIN L. WIEGAND CO., IC-76
Radiant Heating Div.
7503 Thomas Boulevard, Pittsburgh 8, Pa.

Please send me:

- ☐ Vacuum Forming Report
- ☐ Application Report No. R-121
- ☐ Plastics Application Handbook

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GLASS FIBRE MAT

for better mouldings



Just as metal tie-rods increase the strength of concrete, so Deeglas Glass Fibre Mat makes possible stronger plastic mouldings. Deeglas reinforced plastic is being used in increasing quantity by the Services and Industry, particularly for aircraft parts, boat hulls and car bodies. Deeglas offers the following advantages. It is easy to handle and simple to mould. It has an even distribution of fibre, and does not vary in density across width or length. Deeglas can now be supplied pre-impregnated with a range of resins.

Deeglas PUTS **STRENGTH** INTO PLASTICS

For further details and samples of Rovings, Chopped Fibre and Cloth write to:

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Craven House, 121 Kingsway, London, W.C.2, England.

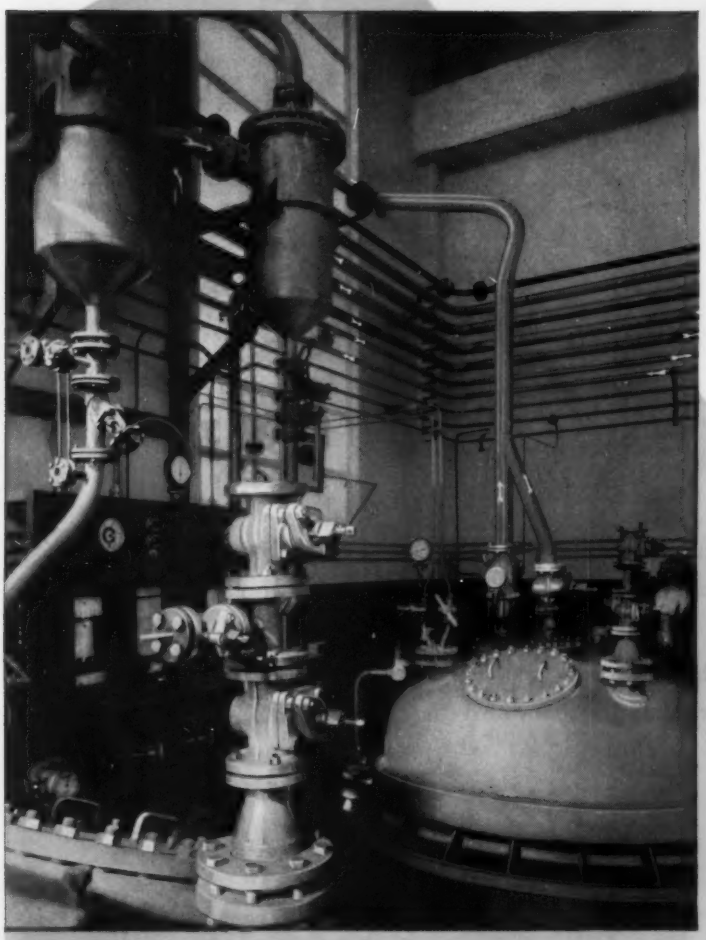
GD.3

Another SD project

new european PVC plant in production

One of the two largest chemical firms in Europe is now in commercial production with an improved polyvinyl chloride process. Developed and designed in collaboration with SD, the output of this new plant will be used in the manufacture of calendered film and sheet products, electrical insulation, and extruded and molded items, both plasticized and nonplasticized.

A contract for another plant in America, completely engineered by SD's staff for production of both mono and polyvinyl chloride, has just been completed by SD.



SD's experience in this field also led to the development of a *streamlined, low-budget packaged PVC plant.* Designed for both large and small firms, the new SD package plants can be built for production capacities anywhere in the range of four to fifteen million pounds of PVC a year.

In addition to this new PVC plant, SD has also concluded three other European developments within the past year—an antibiotic pilot-production plant for a Belgian research center, an ethylene oxide plant built for Naphtachimie of France, and a citric acid plant in collaboration with the Dutch firm of Noury & van der Lande.

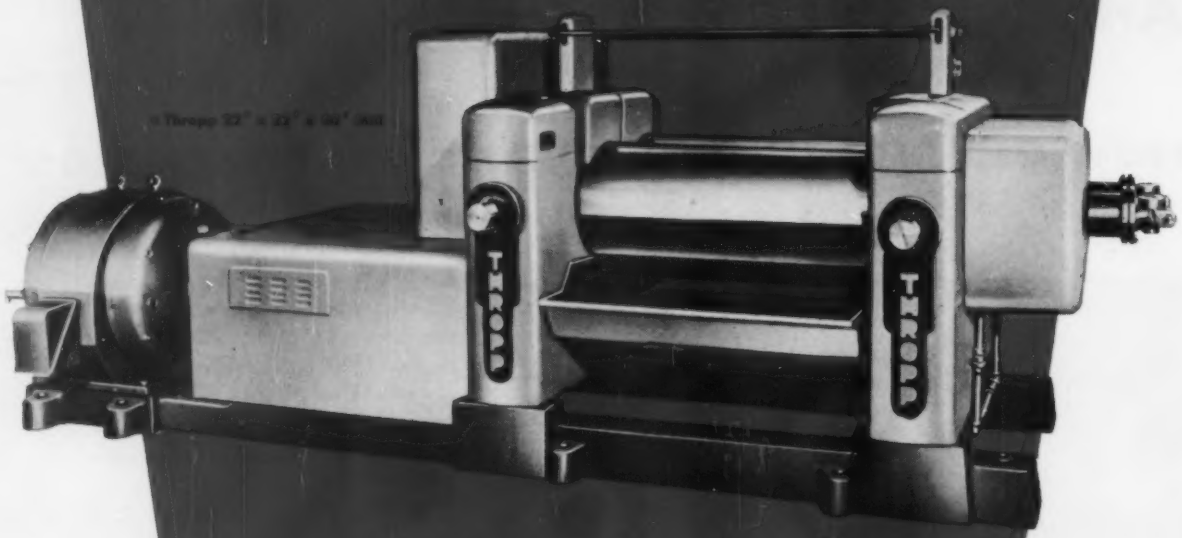
In new plant construction *or* the revamping of existing facilities to increase production efficiency, you will profit by utilizing SD's specialized experience in organic chemicals plant design. Services are available to you, on a confidential basis, on any problem involving a process of your own, or one to be procured or developed.

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Executive Offices: 2 Park Ave., New York 16, N. Y. • Engineering Offices: Jersey City, New Jersey

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It was *your* experience, and that of many other rubber and plastics manufacturers that prescribed the specifications for this—our latest 60″ mill:

The clean, streamlined design affords a new concept in milling—combining minimum maintenance and maximum efficiency with superior performance.

Send for further information.

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Division of
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Throughout the world they're using 'PERSPEX' *display signs*

Here are five good reasons why 'PERSPEX' is outstanding for display signs.

1. It is available in a wide range of light-fast, attractive, transparent, translucent, and opaque colours and also in diffusing opal and clear sheet form.
2. It can be used indoors and out, under all climatic conditions and needs nothing but a wash now and then. It has excellent dimensional stability.
3. Colour designs and lettering can be applied to 'PERSPEX' by both silk-screen printing and the integral printing processes.
4. 'PERSPEX' is light and easily fabricated.
5. Both edge and interior light can be used to illuminate 'PERSPEX' signs.



'PERSPEX' letters are used on this modern office facia board—made for Harford Kingham and Company F.A.I. by Sign Arts Ltd., West Bromwich, England.



Shell Oil Co. Sign in 'PERSPEX' made in England by Thermo-Plastics Ltd., Dunstable and in the U.S.A. by Steiner Plastics Mfg. Co. Inc., Glencove, Long Island, New York.

'PERSPEX' is the registered trade mark of the acrylic sheet manufactured by Imperial Chemical Industries Ltd.

ICI

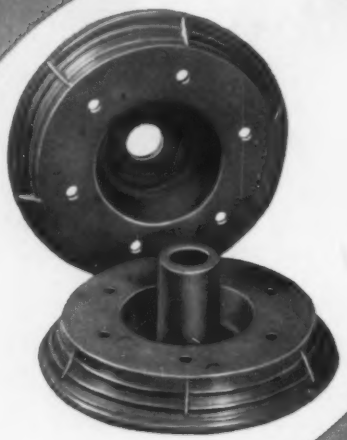
IMPERIAL CHEMICAL INDUSTRIES LIMITED,

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P.572

for **TOUGH** molding jobs...



METASAP® STEARATES

deliver easier mold release

HAVE you tried Metasap Zinc or Calcium Stearates for easy ejection from the mold of intricate shapes, for deep drawing, or for larger-than-average pieces? You'll find they give just the results you want.

Blend these fine stearates into the molding compound—or sprinkle them on the molding surface. Either way, you'll find you need lower ejection pressures, get higher output, fewer rejects, better finished products. Molds last longer too.

So specify compounds containing Metasap Stearates or incorporate them into your own molding compound. Metasap Technical Service will gladly help you find the materials and mixing procedures best fitted to your production methods.

And to produce economical plastigels . . . Metasap offers a complete line of quality stearates, effective as thickening agents. Free testing samples of Magnesium, Barium, Calcium, or Aluminum Stearates are yours on request.

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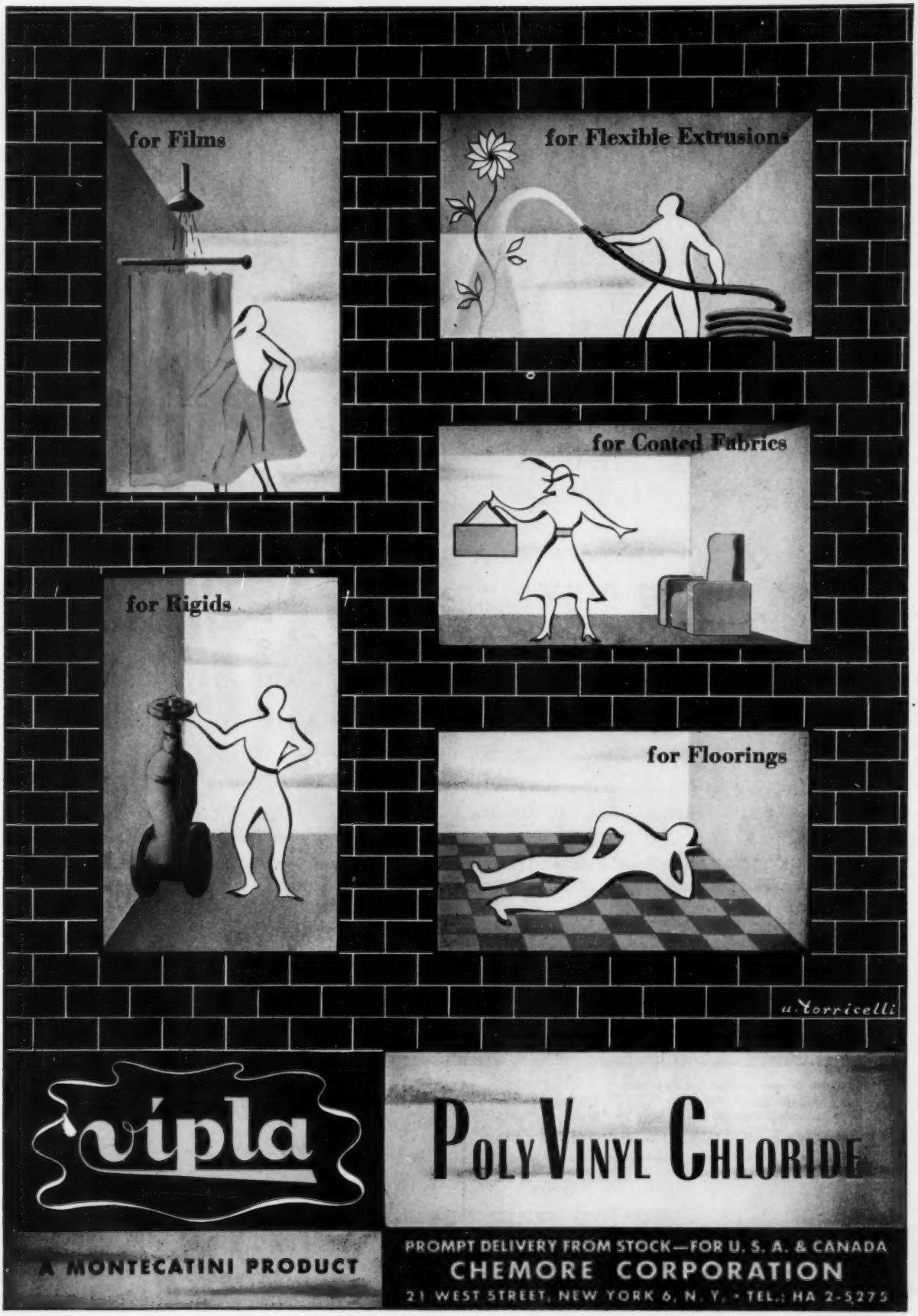
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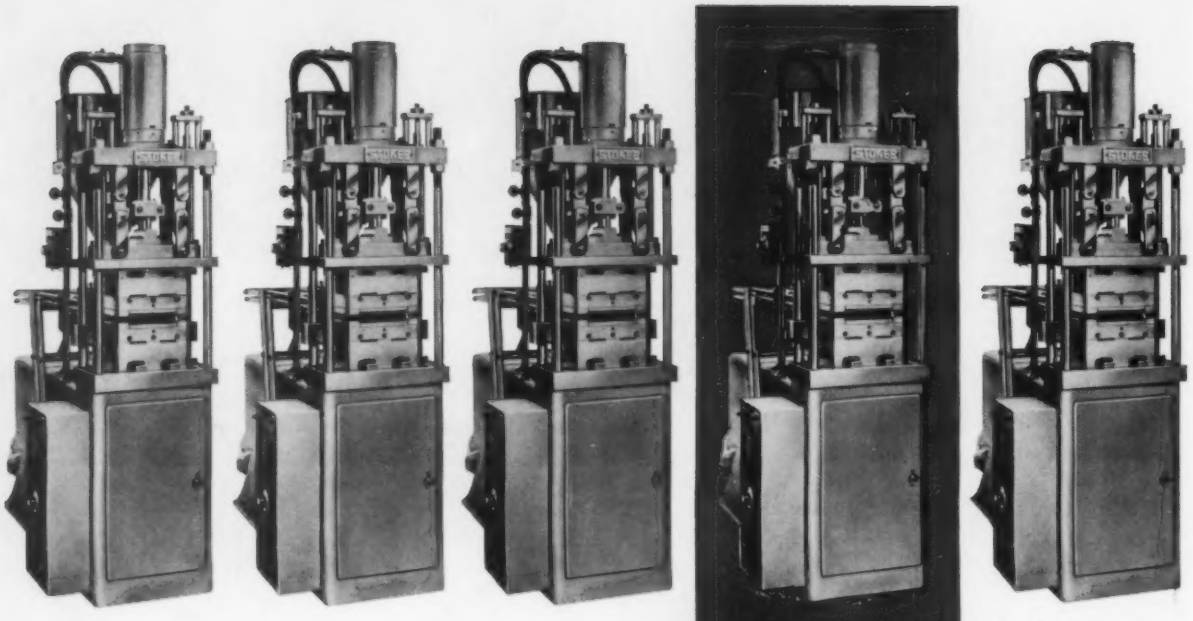
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of Calcium • Aluminum • Lead • Magnesium • Zinc


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Molding machine courtesy F. J. Stokes Machine Co. Philadelphia, Pa.

Faster curing new **DURITE GP-102** adds 25% capacity

Users of DURITE GP-102 have found it cures an average of 25% faster. This gives more capacity from each press . . . lower cost per part.

DURITE GP-102, in black or brown, produces molded parts with rich surface lustre and good strength. Available in hard or medium flow. The unique flow and cure characteristics of DURITE GP-102 make it adaptable for a wide range of applications . . . for compression, transfer and plunger molding.

Get all the facts about this versatile phenolic molding compound. Mail the handy coupon below for a sample and descriptive literature . . . or to arrange a demonstration by your DURITE representative in your plant.

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The Borden Company, Chemical Division MP-104
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☐ Please send sample and technical description of DURITE GP-102
☐ Please have your technical representative arrange a demonstration of GP-102 in my plant

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DURITE

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THE *Borden* COMPANY
CHEMICAL DIVISION



THIS PLASTISOL EXPANDS UNDER HEAT AT ATMOSPHERIC PRESSURE TO FORM A VINYL SPONGE

Sponge Plastisol is a recent development in the versatile family of flexible plastisol products.

Spraying:

Sponge Plastisol may be sprayed to flat, vertical or curved surfaces. Varied uses as sound deadening or insulation against heat or cold on refrigerators, air-conditioning units, automotive bodies may be obtained.

Spreading:

Spread coating on textile or paper stock, etc. may be accomplished with Sponge Plastisol.

Molding:

Sponge Plastisol may be poured into molds to form arm rests, crash pads, gaskets, squeeze balls, etc.

Dip Coating:

Dipping of wire baskets, etc. to insulate against shock is a typical application of Sponge Plastisol.

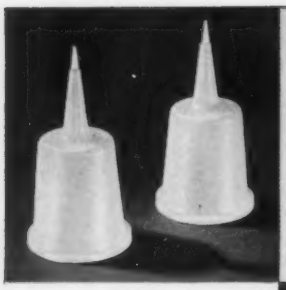
The Watson-Standard laboratories have formulated compounds for many end uses and methods of application. We will assist you with your problems.

Watson-Standard CO.

225 GALVESTON AVE., PITTSBURGH 30, PA.

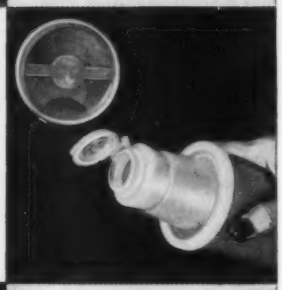
NEW YORK OFFICE: 15 Park Row, New York 38, N. Y. • CHICAGO OFFICE: 55 E. Washington St., Chicago 2, Ill.

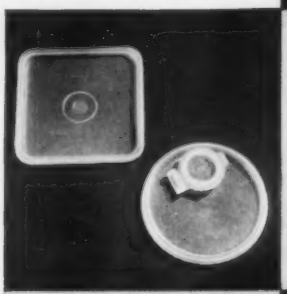
PLASTICS · INDUSTRIAL FINISHES · CHEMICALS





NOBODY HAS AS MUCH EXPERIENCE AT MOLDING POLYETHYLENE AS TUPPER!





Tupper Seals are air and liquid-tight flexible covers. The famous Pour All and Por Top covers are designed for easy dispensing. They are made in sizes to fit all Tupperware containers.

The logical molder for you to consult regarding that product or package of yours which is to be made of polyethylene is Tupper. Tupper has done more than any other molder to make molded polyethylene a practical reality.

Aside from having designed, patented, and promoted successful seals, closures, and dispensers for polyethylene containers, the Tupper Corporation has vast experience in *every phase* of polyethylene packaging and polyethylene injection molding. This experience will be of major importance in improving your product, in reducing your costs, when Tupper goes to work for you.

Tupper's combination of experience, technical ingenuity, and the most modern equipment is at your service for the custom molding of your product in polyethylene. You can do no better than the best ...and the best at molding polyethylene is Tupper!







When equipped with Tupper Seals, Tupper Canisters, Sauce Dishes, Wonder Bowls, Cereal Bowls and Funnels in various sizes are the most versatile reusable containers you have ever seen.

TUPPER!
TRADE MARK

TUPPER PRODUCTS ARE FULLY PROTECTED

About 150 United States and foreign patents and patents applied for, plus numerous trademarks and copyrights, cover the design and manufacture of the various types of Tupper Seals and other Tupper Products. Unauthorized manufacture of items covered by Tupper patents will subject infringers to prosecution.

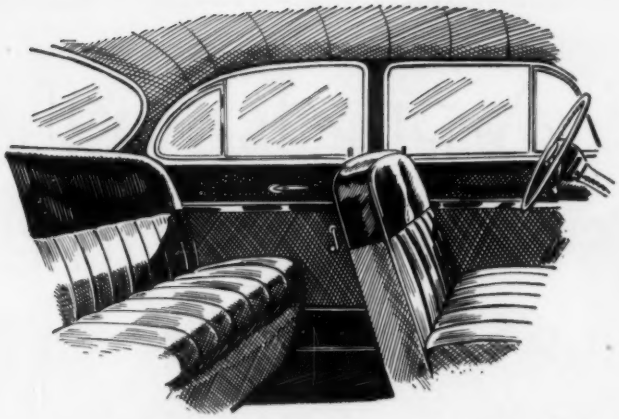
TUPPER CORPORATION

Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

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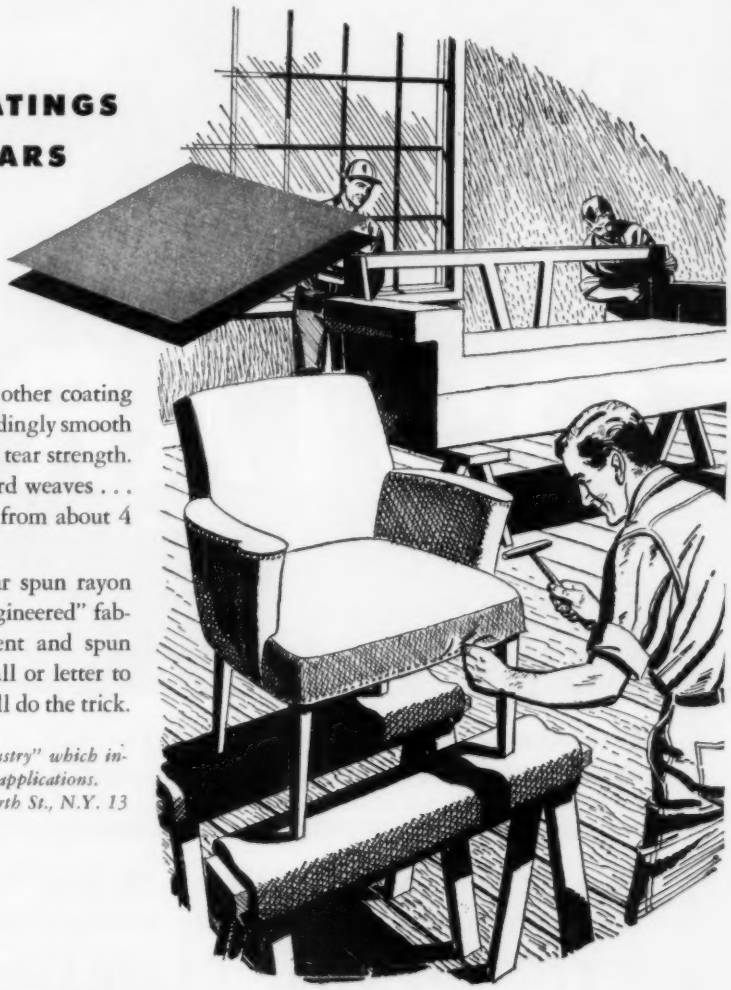


The uniformly high quality of Wellington Sears drills has established them in a wide variety of large-volume coating applications.



Smooth weave surface, high tear resistance, and tensile strength are important coating features of Wellington Sears sateen.

YOU GET SMOOTH COATINGS WITH WELLINGTON SEARS SPUN RAYON FABRIC



Already established as a solid favorite in the upholstery field, Wellington Sears spun rayon fabric is developing rapidly in other coating applications. It meets the need for an outstandingly smooth and clean coating surface that is also high in tear strength. The fabric is available in a range of standard weaves . . . widths up to 60 inches . . . and in weights from about 4 to 10 ounces per square yard.

Why not let us tell you more about our spun rayon fabric and other Wellington Sears "fiber-engineered" fabrics. These include filament rayon; filament and spun nylon, Orlon*, Dacron**; spun dynel. A call or letter to your nearest Wellington Sears sales office will do the trick.

Write for a free copy of "Modern Textiles For Industry" which includes pertinent information on fabric-and-plastic applications. Address: Wellington Sears Co., Dept 101-J, 65 Worth St., N.Y. 13

*DuPont's trademark for its acrylic fiber.
**DuPont's trademark for its polyester fiber.

Superior Fabrics for Coating and Laminating

- Single filling ducks
- Army ducks
- Single and plied-yarn chafers
- Special ducks
- Sateens
- Twills
- Broken twills
- Drills
- Sheetings
- Nylon, rayon and other synthetics
- Lantuck non-woven fabrics

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A SUBSIDIARY OF WEST POINT MANUFACTURING COMPANY

FIRST In Fabrics For Industry

WELLINGTON SEARS COMPANY, 65 WORTH STREET, NEW YORK 13, N. Y.

Offices In: Atlanta • Boston • Chicago • Detroit • Los Angeles • New Orleans • Philadelphia • San Francisco • St. Louis

A product of progress through integration



FOSTARENE®

A VIRGIN POLYSTYRENE

Fostarene is a virgin polystyrene, a product of Foster Grant's new styrene monomer and polymerization plants.

MADE BY A MOLDER DEDICATED TO THE FUTURE OF **POLYSTYRENE!**

Foster Grant uses Fostarene in its own molding machines... reassuring proof of its uniform quality. Fostarene is available in pellets and granules.

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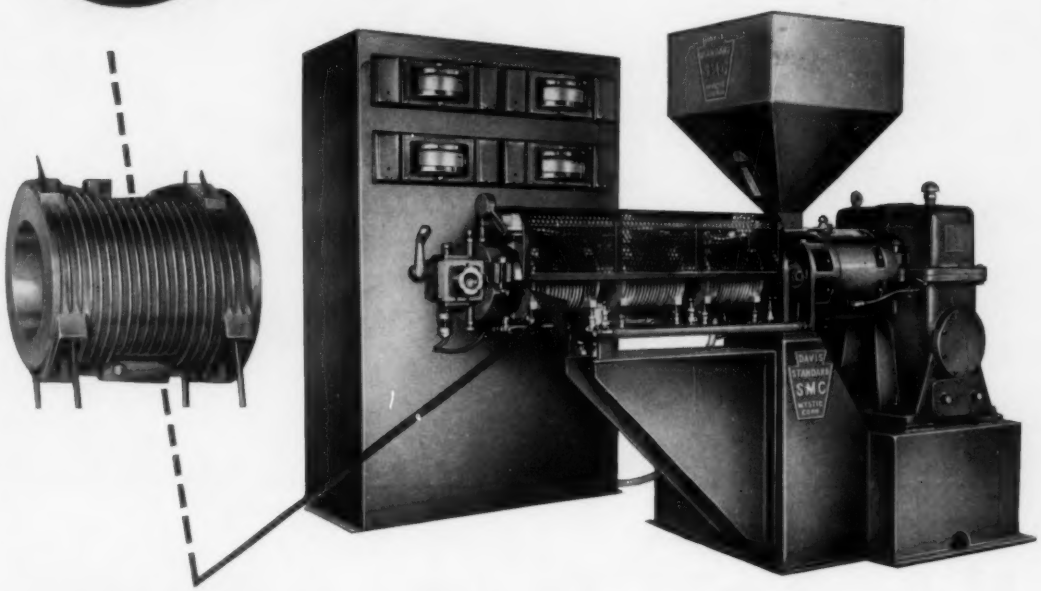
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FOSTARENE® PETROCHEMICAL DIVISION **FOSTER GRANT CO., INC.** LEOMINSTER, MASS

A PIONEER IN PLASTICS FOR OVER THIRTY YEARS

Proved!

PRECISE TEMPERATURE CONTROL FOR EXTRUDERS



*THERMA-FIN

Successful in the field for 5 years!

Developed by Davis-Standard and installed exclusively on Davis-Standard extruders, THERMA-FIN controls exactly the extrusion temperature of thermoplastics and rubber.

A combination heater-cooler unit, THERMA-FIN includes tubular heating elements and stainless-steel cooling water tubes cast side-by-side in a finned aluminum jacket. This dual control gives continuous and positive regulation of temperature through the entire extrusion process. The elements, completely cased in aluminum, never get red hot.

Now, instead of a separate extruder for each material, one machine, equipped with THERMA-FINS, can extrude a wide variety of plastics and rubber materials.

Development of THERMA-FIN is another example of Davis-Standard's continuing effort to remain the world's foremost manufacturer of extruders for rubber and plastics.

*Patent pending

DS DAVIS-STANDARD SALES CORPORATION

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Sole selling agents for

THE STANDARD MACHINERY COMPANY

World's Largest Manufacturers of Custom-Built Extruding Machines

Another new development using

B. F. Goodrich Chemical *raw materials*



Official U. S. Navy Photo

Helps Jet Fly Right — even upside down!

WHEN a pilot takes off in this Chance Vought jet fighter, he flies one of the Navy's finest and fastest carrier-based aircraft. Hycar rubber pendulums in two complete and independent hydraulic systems help make this possible even if one of the systems is damaged.

In each hydraulic fluid reservoir, the Hycar rubber pendulum serves as the suction line. It is designed and weighted so that it remains in the hydraulic fluid, maintains suction and keeps air out of the system—even if the jet flies upside down!

Hycar rubber was chosen for this vital job because it remains unaffected after prolonged immersion in mineral oil (Spec. MIL-O-5606) and Hydrolube (Spec. MIL-F-7083)—materials that would cause ordinary rubbers to swell and lose their flexibility. Hycar also retains its strength and flexibility through the wide temperature range experienced during high speed, high altitude flight. Its excellent molding characteristics permit manufacturing the pendulums within close tolerances and with few rejects. Hycar forms a permanent bond to the metal weights molded into the pendulums.

Do you have a design problem that requires a rubber with excellent oil and solvent resistance? . . . Hycar is your answer. For technical information, please write Dept. HV-5, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



These pendulums are manufactured by Immel Engineering and Development Company, Dallas, Texas, for Chance Vought Aircraft Incorporated. B. F. Goodrich Chemical Company supplies only the Hycar rubber.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

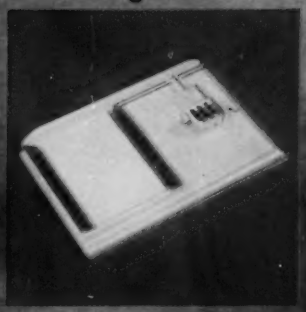
Air Conditioning



Electronics – Aviation



Refrigeration



Farm & Bldg. Equipment

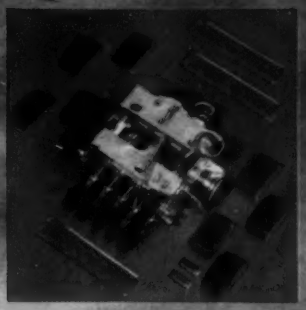


Plastic Molding and Metal Stamping for America's Great Industries

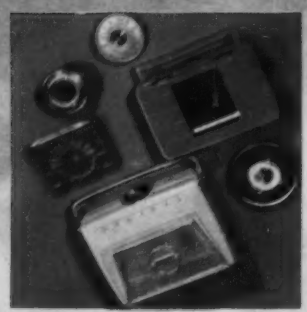
by

Santay

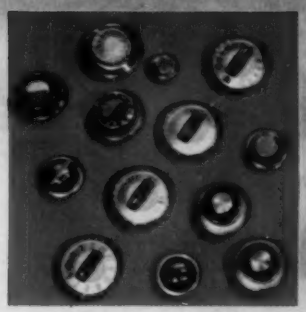
Automotive



Radio

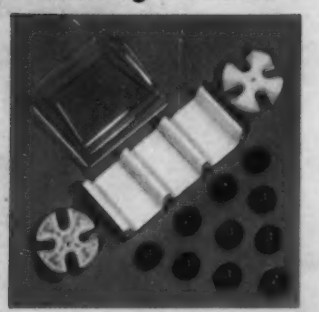


Television

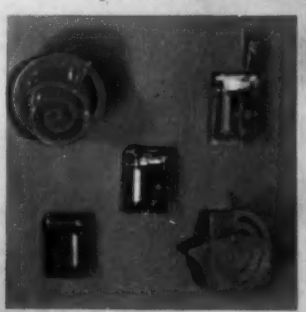


Components combined of metals and plastics, used by America's great industries for America's greatest products, are molded, stamped and assembled by SANTAY. Companies large and small alike choose SANTAY for its versatile experience and engineering skill in the application of these materials as well as for the convenience and economy of having their products completed under one roof... over 125,000 sq. ft. devoted exclusively to custom molding and metal stamping.

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Write today for new, informative, full color book. It's yours without obligation, of course.





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Santay
SYMBOL OF PRECISION CRAFTSMANSHIP

BATTENFELD

ONCE AGAIN THE BIG HIT

IN FULLY AUTOMATIC INJECTION MOULDING

AT THE *Industrial Fair Hannover*
April 25th - May 4th 1954

Striking examples of the efficiency of Battenfeld's Injection Moulders



28 oz. in plexigum
manufactured in W-Germany



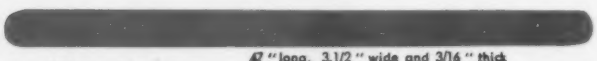
18 oz. in polyethylene
manufactured in Belgium



18 oz. in polyethylene and polystyrene
manufactured in W-Germany



13 oz. in nylon
manufactured in Switzerland



14 oz. in nylon
47 " long, 3.1/2 " wide and 3/16 " thick
manufactured in W-Germany

ELECTRO-MECHANICAL DRIVE + PNEUMATIC FOLLOW-UP PRESSURE
with built-in experience and advanced modern engineering

BATTENFELD builds this range

Horizontal

BSM	20 S	0.7 oz.
BSM	40	1.4 oz.
BSM	40 S	1.4 oz.
BSM	100	3.5 oz.
BSM	100 S	3.5 oz.
BSM	160	5.7 oz.
BSM	300	10.7 oz.
BSM	450	16 oz.
BSM	450 Sp	16 oz.
BSM	800	28 oz.
BSM	1000	36 oz.

S – Speedy
Sp – Special construction

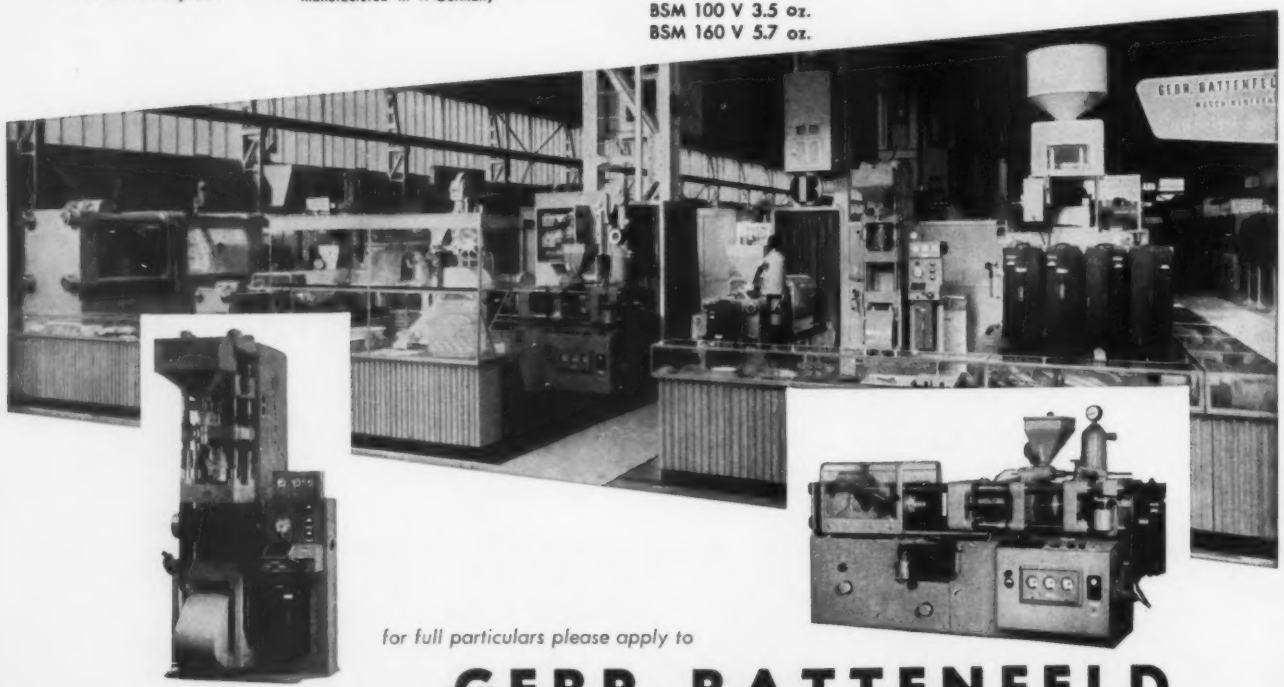
Vertical

BSM	20 V	0.7 oz.
BSM	40 V	1.4 oz.
BSM	100 V	3.5 oz.
BSM	160 V	5.7 oz.

At the Fair with

3 BSM	40 S	
1 BSM	40 V	
1 BSM	100 S	
1 BSM	160	
1 BSM	300	
1 BSM	450	

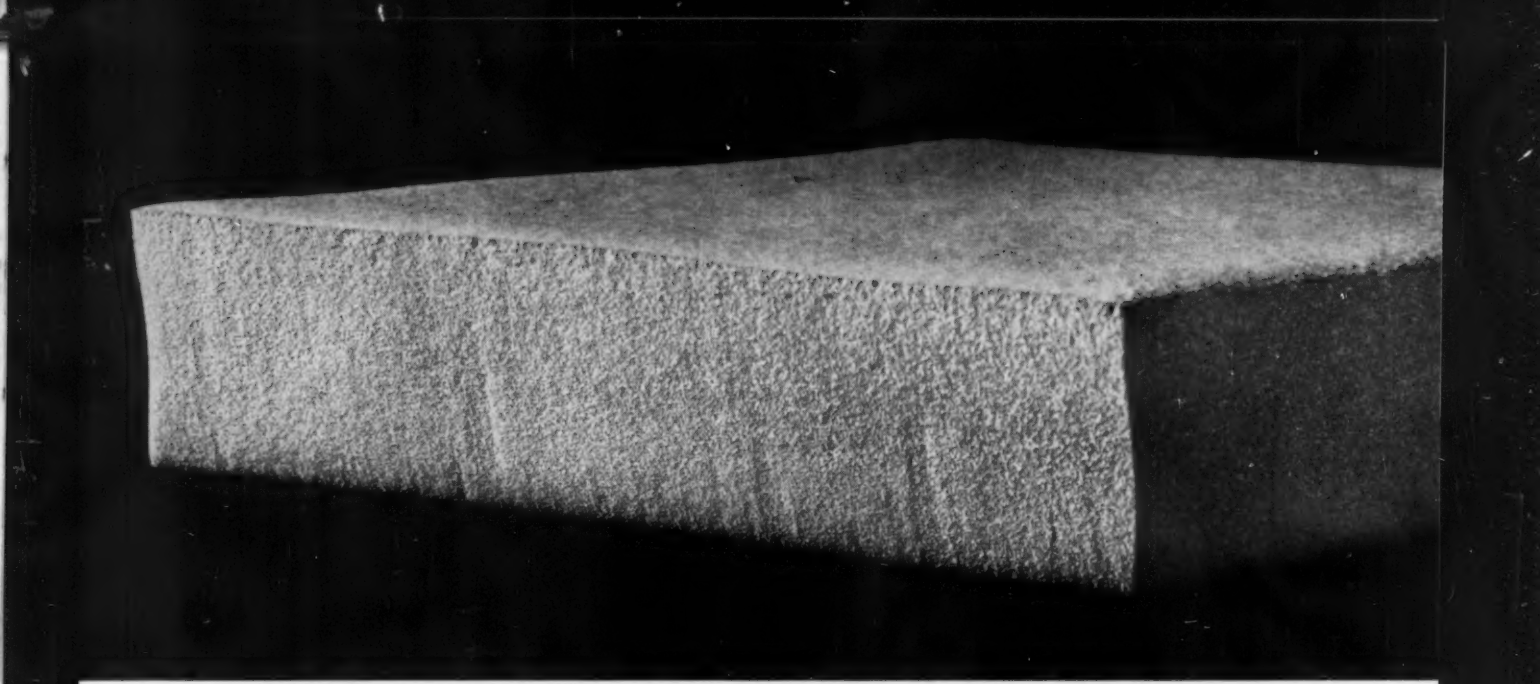
and
2 Compression Moulders
50 and 100 tons pressure
and the most convincing array of injected articles



for full particulars please apply to

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MASCHINENFABRIK
MEINERZHAGEN I. W.
(WESTERN GERMANY)
Telegramm-Adresse: Battenfeld



You can now make low-density polyvinyl chloride sponge at atmospheric pressure with DU PONT BL-353

This new Du Pont chemical blowing agent has the following advantages:

REQUIRES no special equipment

PRODUCES consistent results in a simple operation.

OFFERS wide latitude in formulating plastisols.

PERMITS use of low-cost extenders and fillers.

PERMITS a wide range of densities, down to less than 6 lbs./cu. ft.

PRODUCES soft resilient sponge, supported or unsupported, up to several inches in thickness.

PRODUCES excellent cellular uniformity for a wide variety of cell sizes.

HAS excellent expansion efficiency.

LIBERATES large volume of nitrogen at a uniform rate.

IMPARTS no odor or color.

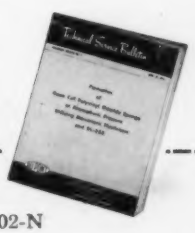
PRODUCES snow-white sponge.

PERMITS production of sponge in a variety of colors and shades.

PRODUCES a predominance of interconnected cells.

MAY be used in slush-molding operations.

SEND FOR FREE BULLETIN. Our new bulletin explains how BL-353 is used to make high-quality sponge that may be just what you need for your application. If you would like a free sample for experimental work, just write: E. I. du Pont de Nemours & Co. (Inc.), Chemical Sales, Explosives Department, Room 11502-N, Wilmington 98, Delaware.



Du Pont BL-353

Product of Du Pont Explosives Research

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Chemical Sales, Explosives Dept., Room 11502-N
Wilmington 98, Delaware

Please send me a copy of your free bulletin describing the use of BL-353 in making polyvinyl chloride sponge. I am interested in using sponge for. . . . . .

*Name*_____ *Title*_____

*Firm*_____

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Before You Buy Any...

Plastic Molding Machine

be sure to see the New Improved
High Speed • Fully Automatic

MOSLO Model 73

FOR
PERFORMANCE
CAPACITY
DEPENDABILITY
SIMPLICITY
SAFETY
APPEARANCE



SEE THE NEW RE-DESIGNED MOSLO LINE
—FULLY AUTOMATIC FOR ALL REQUIREMENTS

Before you buy any plastic molding machine, either fully automatic or hand operated, we urge you to investigate the features of the MOSLO line. These are the machines that are setting new and higher standard of quality production for many types of molding operations. They have the effective controls, rugged construction, reliability and speed that make profitable production possible, year after year, in all lines of the plastic molding industry. Savings extend to materials and mold cost as well as productive time.

Hydraulic Manifold

The "Heart" of a Moslo Machine

All hydraulic valves are mounted on a convenient hydraulic manifold. This manifold eliminates 60% of the pipe fittings normally installed in an injection molding machine. It simplifies maintenance problems and eliminates many potential oil leaks.

MODEL 73

- 2 oz. injection capacity per shot
- 1200 cycles per hour
- 25 lbs. per hr. *plus* plasticizing capacity
- Molds 20 square inches of area *plus*
- Material hopper capacity—40 lbs.
- Mold opening 6"

MODEL 75

- 2-3 oz. injection capacity per shot
- 740 cycles per hour
- 50 lbs. per hr. plasticizing capacity
- Molds 40 square in. of area
- 50 lbs. capacity of material hopper

This machine is available with mold arrangement and cycle to fit requirements of mold opening from 8 to 16 inches.

MODEL 80

- 3-4 oz. injection capacity per shot
- 780 cycles per hour (dry run)
- 75 lbs. per hr. plasticizing capacity
- Molds 60 sq. inches of area
- 60 lbs. capacity of material hopper
- Mold opening 8"

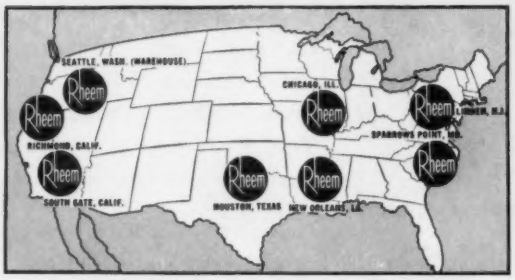
Write, wire or call to arrange a demonstration. We have a Model 73 set up for a working demonstration at your convenience.

MOSLO MACHINERY COMPANY

2443 PROSPECT AVENUE • CLEVELAND 15, OHIO

GET BOTH STEEL AND FIBRE DRUMS QUICKLY-FROM ONE SOURCE-RHEEM

RHEEM STEEL CONTAINERS ARE MADE IN SEVEN STRATEGIC LOCATIONS



Rheem Fibre Drums are being manufactured in four of these plants. Production lines are scheduled for installation in other plants soon.

"FAMILY IDENTIFICATION"

Rheem can furnish on Fibre drums the same type of decorative service it provides users of Rheemcote lithographed steel drums. Any design or trade-mark can be reproduced on an all-over label for Fibre drums in any number of colors to provide "family" identification for your products.



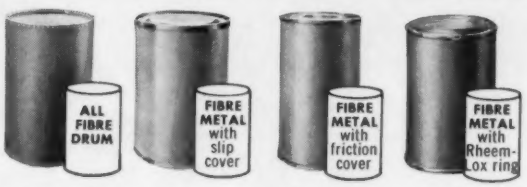
55-gal. Rheemcote Steel Drum

30-gal. Rheem Fibre-Metal Drum

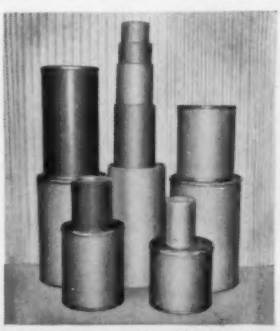
RHEEM ANNOUNCES A COMPLETE LINE OF FIBRE DRUMS TO SUPPLEMENT ITS STEEL SHIPPING AND EQUIPMENT CONTAINER LINES

To supplement its line of steel shipping and custom equipment containers, Rheem has added a complete line of Fibre and Fibre-Metal drums. These strong, lightweight, inexpensive drums come in four types and in a wide range of sizes.

Choose the Drum that Fits Your Needs



Choose the type that best fits your needs—All-Fibre drums, or Fibre-Metal drums with either slip or friction covers or with the new, easy to install and remove Rheem-Lox ring. Only Rheem offers all these types of low-cost containers.



Choose the Size that Fits Your Needs

Choose the size that best fits your needs. Fibre drums from 1 to 32 gallons in capacity; Fibre-Metal drums from 5 to 60 gallons. There is virtually a size for every possible requirement.

MAIL COUPON IN NOW! *for complete information*

RHEEM

MANUFACTURING COMPANY

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Houston 20, Texas • New York 22, New York • South Gate, California
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NOW, MORE THAN EVER BEFORE, YOU CAN RELY ON RHEEM FOR ALL YOUR SHIPPING CONTAINER REQUIREMENTS

RHEEM MANUFACTURING COMPANY
(Mail to Nearest Sales Office, Listed at Left)

☐ We would like to have your packaging engineers come to our plant and study our shipping container problems.

☐ Please send additional information.

NAME OF COMPANY_____

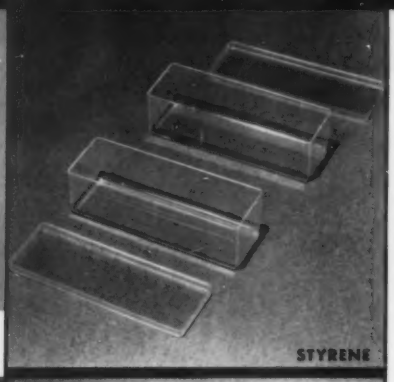
STREET_____

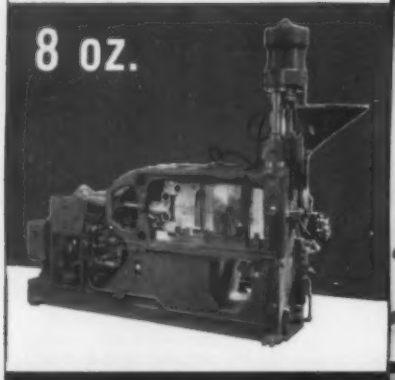
CITY_____ ZONE____ STATE_____

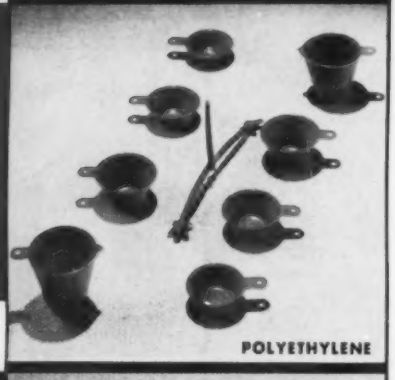
BY_____ MPL-10

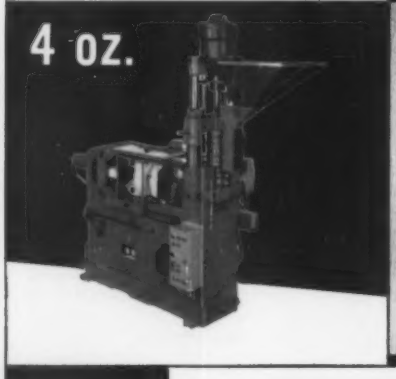
Here's what FEDERAL TOOL learned about LESTERS

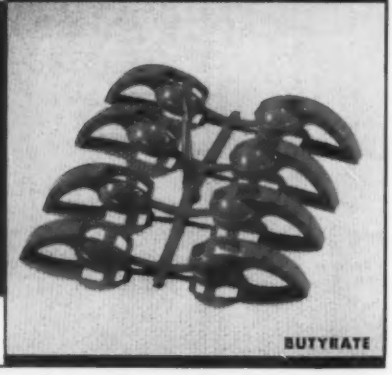












It takes some doing, to arouse enthusiasm over a new molding machine in an old and experienced molding shop. But that's exactly what happened at Federal Tool Corp. in Chicago when their new Lesters went to work.

No wonder, when in several cases production was actually doubled! Oversize shots and oversize areas have been handled with ease. They even reduced part weights through the rigid Lester locking assembly.

As Mr. Ray Olson, plant manager says, "We were frankly surprised by the performance of the Lesters. We knew we were buying good machines, but we never expected such a wide margin of difference."

Write for complete specifications on the machine suited to your molding requirements and ask to receive the Lester-Phoenix house organ, "The Lester Press."

LESTER INJECTION MOLDING MACHINES

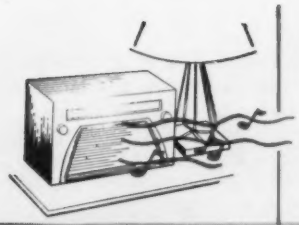
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They needed a plastic to make strong, heat resistant radio parts



KOPPERS POLYSTYRENES

Type 3 General Purpose Polystyrene
Type 7 Improved Heat Distortion Temperature
Type 8 Highest Heat Distortion Temperature
MC-185 "High Impact," Lowest Water Absorption Rate
MC-305 "High Impact," Easy Flow
MC-309 "High Impact," Highest Heat Distortion Temperature
MC-405 "Medium Impact," Easy Flow
MC-409 "Medium Impact," Highest Heat Distortion Temperature

• Most people treat radios with care, but accidents do happen. Take small radios, the kind you use in the breakfast nook or at the bedside. They're often jarred or bumped, so they have to take shock and impact.

Heat is another problem with small radios. They're often carried outside in the hot sun, or they sit near a window where the sun pours in. Both this external, and the internal heat generated by the radio, tend to make some plastic radio cabinets warp out of shape. That's why leading radio manufacturers have been looking for plastic parts that can take both bumps and heat. They found what they wanted in Koppers Heat Resistant—High Impact Polystyrenes. These plastics contain *rubber*, which makes the polystyrene strong and durable.

New radio cabinets, dials and knobs made with these plastics come in bright colors. They are light weight and have smooth, easy-to-clean surfaces.

Koppers Heat Resistant — Heat Impact Polystyrenes have production advantages, too. They are dimensionally stable and flow easily in the mold.

If you would like to get sound engineering advice about the use of Koppers Polystyrenes in your product, write or call your nearest Koppers Office.

Koppers Plastics Make Many Products Better and Many Better Products Possible.

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BARBER COLMAN

Wheelco

. . . versatile NEW 400 Series Capacitrols

You saw them at the Plastics Show! The *new* Wheelco Models 402 and 407 Capacitrols bring you the latest and finest in instrument features, including: ultra-sensitive control action . . . fully "plug-in" construction . . . large, easy-to-read indicating scale . . . attractive, modern styling . . . greater over-all accessibility for inspection and servicing . . . unusual stability with respect to line voltage and ambient temperature changes . . . convenient "tuning" adjustment . . . and remarkably low cost. Model 402 gives you "anticipatory" time-proportioning control. Model 407 introduces a *new* and precise control form for smoothly and "steplessly" proportioning *electrical* power input in accordance with system demands. Meet all control requirements of injection molding and extruding machines, as well as plastic packaging and forming machines. Ask your Wheelco engineer for details, *today!*

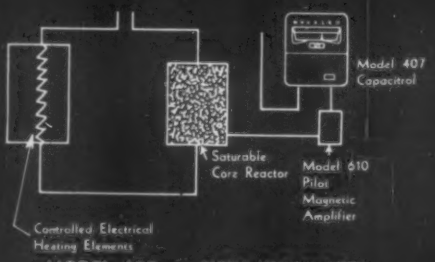


FULLY "PLUG-IN" DESIGN

Control chassis and measuring system are easily and quickly removed for inspection or servicing.







MODEL 407 — NEW "STEPLESS" ELECTRIC PROPORTIONING CONTROL FOR PLASTICS MACHINES

Write for Bulletin F-6314

Factory-trained field engineers in all principal cities

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1. **Wheelco experience . . . Barber-Colman backing.**
2. **Model 297 at new, low cost.**
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8. **Custom-packaged "Control Centers."**
9. **Complete line of instruments and thermocouples.**

only ONE plant



offers you **ALL** *these*

SPECIAL PLASTICS SERVICES

to help you **REDUCE COSTS, SAVE LABOR**

SHORTEN PRODUCTION TIME, USE LESS MATERIALS

RE-PROCESSING

Your plastic scrap and obsolete molding powder is your insurance for a successful operation. Gering specialists can accomplish miracles with your scrap by grinding, decontaminating and pelletizing. Investigate and SAVE with Gering.

S-T-R-E-T-C-H

POLYETHYLENE COLORANT. Saves 5c to 15c per product pound. Easy, clean, safe. Use 1 part "S-t-r-e-t-c-h" to 3 parts natural polyethylene. Makes bright, attractive colors. No dust, risk or color contamination. Furnished in dust-free uniform-size pellets; packed in 50-lb. multi-ply bags.

DRYCOL

Gering's famous, perfected dry coloring medium for in-plant, easy coloring of ALL THERMOPLASTICS. No special skill or equipment needed. Standard PMMA, Housewares and Special Colors, Pearls, Metallics and Tinsel effects—put up in unit packages to color 50 and 100 lbs.

CUSTOM COMPOUNDING

Complete Laboratory, Technical and Engineering staffs. BANBURY MIXERS, MILLS, EXTRUDERS, GRINDERS, PELLETIZERS, BLENDERS, BAGGERS and MATERIAL EQUIPMENT to produce large quantities of molding and extrusion compounds in all thermoplastic formulations: POLYETHYLENE, VINYLS, NYLON, ACRYLIC, CELLULOSE ACETATE, BUTYRATE, ETHYL CELLULOSE, POLYSTYRENE and its COPOLYMERS.

PURGING COMPOUND

—for INJECTION MOLDING MACHINE Cylinders . . . to purge, flush and eject all impurities. Specially formulated thermoplastic releasing agent. Highly recommended when color change is necessary, or when change of molding materials is desired. Rapid. Efficient. Economical.

STYROMIX

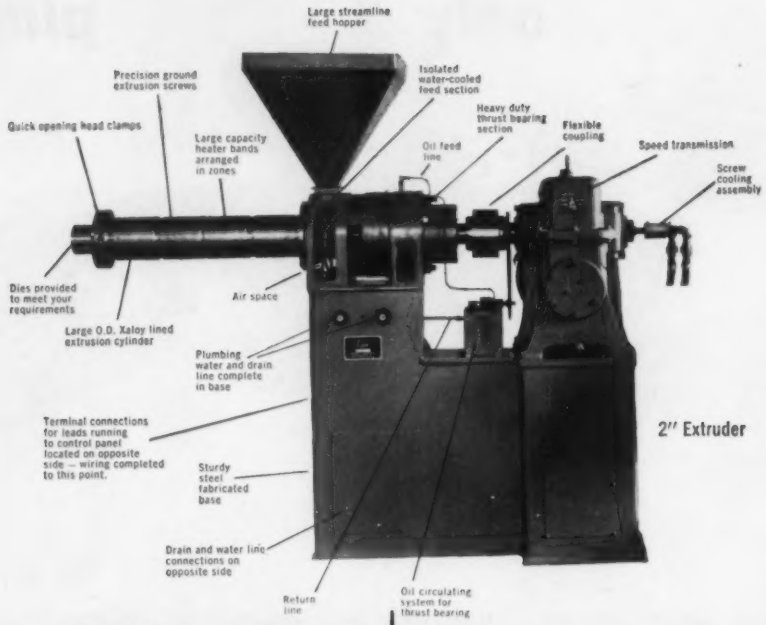
BLENDED POLYSTYRENE with COLORANT. Wherever possible, we recommend Styromix as a money-saver. You get your styrene ready-mixed, in the color you want. No dust, no guessing, no mixing equipment, lower final cost. Standard and Special Colors quickly available.

Who else but **GERING!**

GERING PRODUCTS, INC. Kenilworth, N. J.

"Pioneers in Conversion of Thermoplastics for over 30 Years"

Egan plastic extruder



2" Extruder

compare with the covers off!

Yes, when you remove the covers and get down to the bare facts of construction of this unique extruder, you will find a machine which will have longer effective screw lengths, greater maximum heating capacity, and larger thrust bearing capacity. This will add up to higher production rates, better products, and lower maintenance and operating costs. With the flexible design of the "extrusion" unit consisting of the separate components; screw, heating cylinder, feed section; and thrust bearing housing, we can give you any combination to meet your requirements.

EGAN EXTRUDERS are supplied complete with a *wired* control panel including the main disconnect switch, fuse blocks, contacts and temperature controls *mounted*. Plumbing for the water supply and return lines to the drain are completed in the base. Installation costs are held to a minimum.

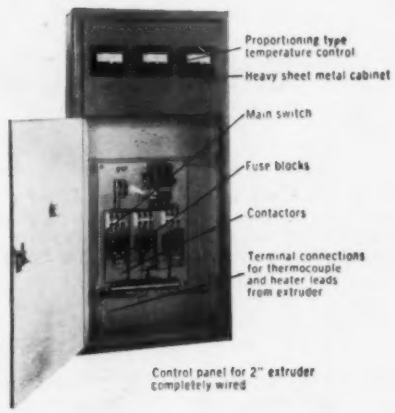
EGAN EXTRUDERS can be furnished with dies, conveyors, take-off equipment and other auxiliary features for a wide range of extruded products.

Write for details or invite our representative to call

FRANK W. EGAN & COMPANY, Bound Brook, New Jersey

Designers and Builders of Machinery for the Paper Converting and Plastics Industries

Cable Address: "EGANCO"— Bound Brook, N. J.



Control panel for 2" extruder completely wired

Compare specifications of any standard Egan Extruder, size for size, with any other extruder.

Standard Sizes (Screw Dia.)—inches	2	2½	3½	4½	6	8
Effective Screw Length—inches	32	40	56	72	96	128
No. Cylinder Sections	1	1	1	1	2	2
Zones of Heating on Cylinder	2	2	3	4	4	4
Maximum Heating Load, KW	12	18	30	48	96	160
Thrust Bearing Capacity, 1000 lbs. @ 50 rpm.	60.5	60.5	119.5	208	288	420
Type Speed Transmission	Worm gear.	Worm gear.	Herr' bone	Herr' bone	Herr' bone	Herr' bone
Usual Motor Size, H. P.	7½-10	10-15	20-30	40-50	50-75	75-150
Approx. Extrusion Capacity lb./hr.	20-50	40-90	75-200	150-450	250-650	450-1200
Approx. Floor Dimensions—inches	40x98	48x112	60x120	84x132	96x156	104x192
Approx. Weight—lbs. (less Drive)	3200	3600	4800	6600	9600	12500

**Extruders are modified to meet requirements for a particular process*

...save up to 50% of finishing time

with

Cascade

PRE-HARDENED DIE STEEL



ANSON TOOL & GAGES, INC.
ERIE, PENNSYLVANIA

reports . . . "Our high level of quality workmanship is backed by the exclusive use of Cascade die steel on non-specified orders for plastic molds. Pre-hardened Cascade's superior machinability has resulted in surfaces that save up to 50% of finishing time while providing surface quality in keeping with our prescribed high standards".

Precipitation hardened Cascade Die Steel is uniform throughout . . . uniformity of hardness, material structure . . . factors that consistently result in better machinability and finer finished surfaces. Send today for Cascade Data Sheet.

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DAKE PRESSES

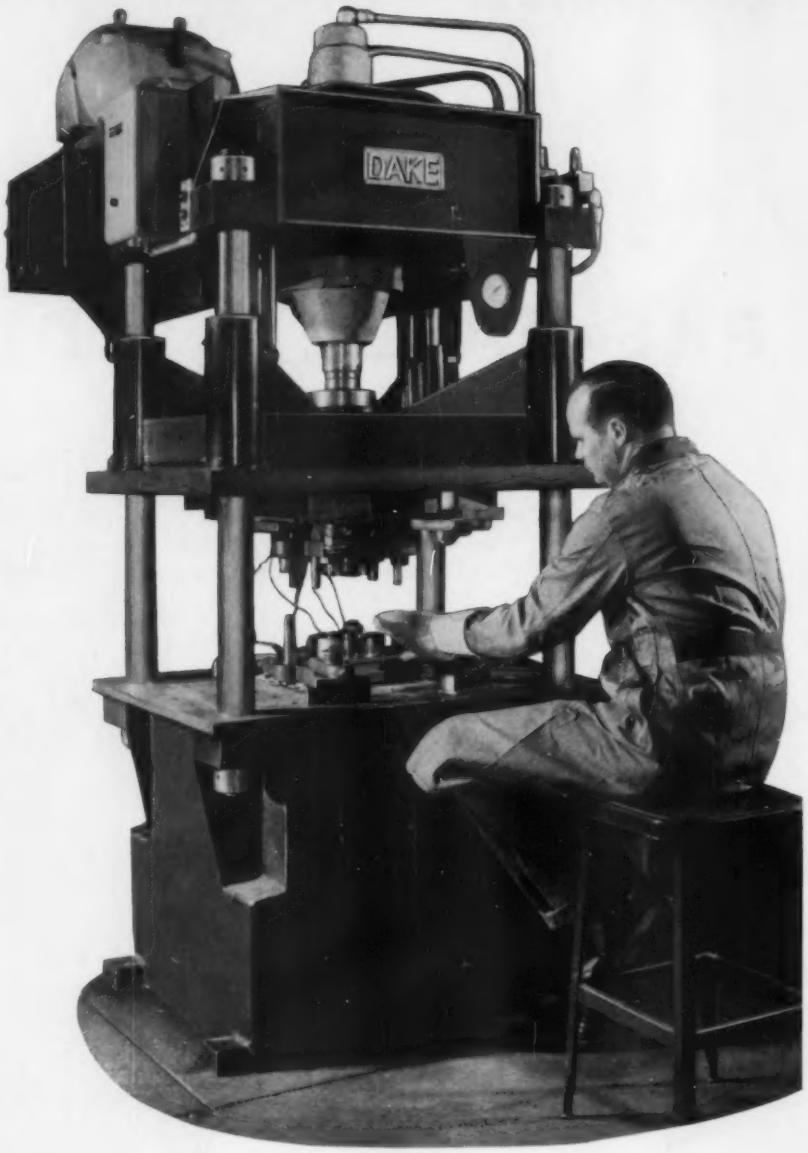
for compression molding reinforced plastics

Dake Plastics Presses are engineered by men experienced in the plastics industry who can help you meet special needs and requirements, as well as provide better equipment for ordinary molding.

Standard models are electric-hydraulic in operation, with capacities ranging from 25 to 300 tons. They are adjustable for stroke, pressure, temperature, and timing of the cure.

The operation is started by pressing dual palm switches (for safety), and is automatic through the entire curing cycle and return of the platen to starting position.

Other presses with simpler controls and less automatic operation are also available. Send for Bulletin #273, and tell us your special requirements.





Dake Engine Company, 648 Seventh St., Grand Haven, Mich.

DAKE PRESSES





color sells . . . in plastics molded by General American

With competition toughening, most products can benefit from the extra sales appeal of *color* in plastics. General American's plastics molding facilities give you sales-making color you need . . . whether brilliant, subdued, contrasting, matching. Color *and* fine finish are *molded-in* for long service life. In addition, special painting, or metallizing can supply unusual effects. What's more, plastics can often give your product new design possibilities, strength, lightness and big volume production. Ask a General American engineer for ideas in plastics to help your sales.

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GENERAL AMERICAN
TRADE MARK

PLASTICS DIVISION

GENERAL AMERICAN TRANSPORTATION CORPORATION 135 South La Salle Street, Chicago 90, Illinois

● **Facilities unmatched anywhere: injection presses to 300 ounces, compression presses to 2,000 tons, reinforced plastics molding, die making, painting, assembly, packaging**

about Benzoflex Plasticizers



STRONGER! Curing temperature with Benzoflex plasticizers can be lower, or greater strength can be obtained at usual curing temperatures.

Cures at lower temperatures... Cuts processing time

Check these advantages of TENNESSEE'S new plasticizers... Benzoflex 9-88 and 2-45 for your vinyl formulations:

1. Equal physical properties of finished products at lower curing temperatures.
2. Shorter processing time.
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5. High solvency for vinyl resins.
6. Plastisols do not swell with age.
7. Low volatility from film.
8. Compatible with other plasticizers.
9. Reasonable cost.
10. Good odor.
11. Low migration to synthetic finishes.
12. Satisfactory low temperature characteristics for most applications.
13. Good color.
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15. Easily stabilized.

Mail the coupon today for complete information on Benzoflex 9-88 and 2-45.

MAIL COUPON TODAY!

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Send complete information on new Benzoflex Plasticizers.

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TENNESSEE PRODUCTS & CHEMICAL *Corporation*
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Producers of: FUELS • METALLURGICAL PRODUCTS • TENSULATE BUILDING PRODUCTS • AROMATIC CHEMICALS • WOOD CHEMICALS • AGRICULTURAL CHEMICALS

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MICRONIZER*
GRINDING MACHINE



Grinds Materials To Any Micron Size Specification

NOW AVAILABLE FOR OUTRIGHT SALE

24" Size
Capacities 1000 to 1200 lbs. per hour

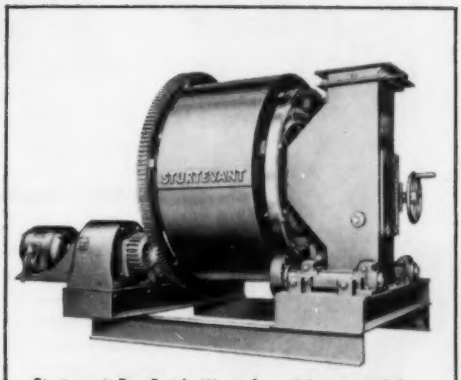
The Sturtevant *Micronizers* are fluid jet grinding machines designed to reduce solid materials to particle sizes in the micron range.

Using compressible fluids, air or steam, as the source of energy, *Micronizers* produce pulverized materials to specifications unobtainable by other mechanical equipment such as ball, pebble or hammer mills.

The variety of materials processed is large and includes both nonmetallic and metallic minerals and ores, metals, pigments, insecticides, fungicides, pharmaceuticals, plastics, dyes and numerous other organic and inorganic products.

It is quickly and easily cleaned on changes of formulation with minimum loss of material. Simple to install and operate. It is available as a machine alone . . . or as a complete grouping with premixing, grinding and bagging equipment. Write for complete information, today.

*Micronizer is the Registered Trademark of the Sturtevant Mill Company.



Sturtevant Dry-Batch Mixer for mixing materials into a homogeneous mass. 5 models: ¼ to 2 tons.

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110 CLAYTON STREET, BOSTON 22, MASS.
Designers and Manufacturers of CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

It doesn't COST to own an ELMES molding press

Elmes Hydrolairs® with Continuous Power Stroke

Most economical of all power presses to buy and use. No pumps or motors. Powered by shop compressed air line. Hydrolairs deliver selected pressure and maintain that pressure, even on compressible materials. Standard 50-ton Floor Model with either lever or (illustrated) electrical control, and 30-ton Bench and Floor Models with lever control.



Elmes® plastics molding equipment, backed by over a solid century of engineering experience, is convenient and simple to use . . . fast, flexible, and economical to operate. An investment in Elmes hydraulic equipment pays big dividends in quality and speed of output. For all kinds of press applications you can count on Elmes for performance that turns cost figures into profit figures.

Elmes offers a complete line of *standard* equipment, including compression and transfer presses; Hydrolairs®—power presses requiring neither pumps nor motors; small-production, laminating, and laboratory presses; and Elmes pump-accumulator systems for group press operation. Or your requirements may call for *special* designs, in which case Elmes engineers can develop custom-built equipment to exactly suit your particular needs.

For detailed information contact your Elmes distributor, or write to us direct.

Compression and Transfer Molding Presses

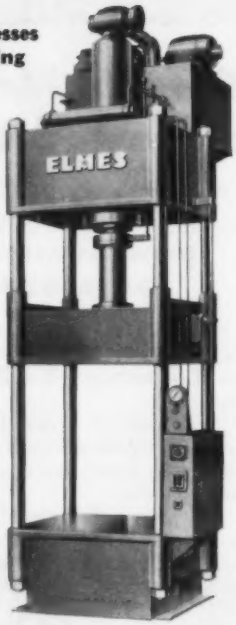
Press changes from straight compression to transfer molding by flicking a switch. In the compression cycle, the circuit provides two selective breathing periods. Opening during breathing can be controlled to suit each specific application. Curing cycle is set by motor-type timer. Pump has compensating control, so that during curing cycle only essential minimum horsepower is used. Available in 50 to 1000-ton capacities, or larger tonnages where required.



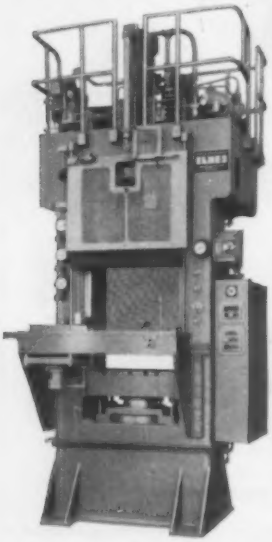
It PAYS!--

New... Complete Line of Presses for Reinforced Plastics Molding

This newly-developed line of Elmes Presses is made in standard capacities from 50 to 300 tons. Larger tonnage presses can be built to suit special requirements.



At right—100-ton Press for Reinforced Plastics Molding



Are Your Requirements Special?

There are times when a standard press won't do. An example is the Elmes custom-built 200-ton Transfer Molding press shown at left. If your requirements call for a press newly-designed—or just a modification of an existing standard design—Elmes background, facilities and foresight can save you dollars and assure you press performance at its best.

All Elmes Presses for Reinforced Plastics Molding are fully pushbutton controlled. Press equipped with rapid advance and return, and adjustable slow pressing and breakaway. Adjustable timer can be pre-set for any length of cure cycle desired. Complete specifications furnished promptly on request.

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ELMES ENGINEERING DIVISION

hydraulic presses and equipment ....1159 TENNESSEE AVE., CINCINNATI 29, OHIO

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FOR PRODUCTS ON THE MOVE



"We couldn't improve the steel," says Washington Forge, "so we improved the handle." Handsome, *durable* handles molded with colorful Hercocel make the new Duraset line of steak knives and kitchen flatware popular-priced, quality merchandise *that moves fast!*

Designed with Hercocel in classic decorator styling, these attractive handles withstand even the high temperatures of automatic dishwashers. They are guaranteed by Washington Forge against loss of their rich luster, won't peel, crack, chip or break, or develop the stickiness often encountered in other materials after frequent immersion in hot water.

In sales, design, and production, versatile Hercocel helps to keep many products on the move. For information on Hercules services to the plastics industry write:

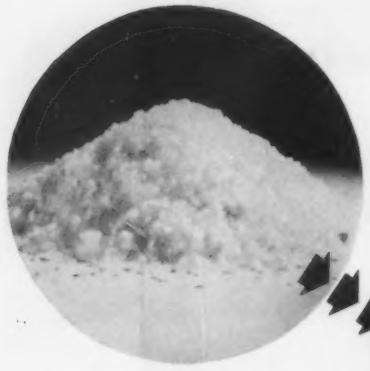


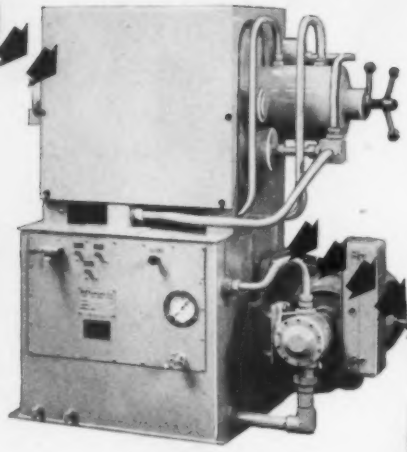
Duraset handles for steak knives and flatware molded with Hercocel by Laurel Plastics, Lakewood, N. J. for Washington Forge, Inc., Fifth Avenue, New York City.

Cellulose Products Department
HERCULES POWDER COMPANY
INCORPORATED
916 Market Street, Wilmington 99, Del.

CP54-7

Save on materials
Reduce flash
Cut finishing costs
Improve product quality





with economical high-speed



BIPEL HYDRAULIC PELLETERS

A LONGSTANDING aim of compression moulders is achieved with preforms made on Bipel Hydraulic Pelleters. These unique *horizontal-acting* machines produce preforms unsurpassed for uniform density and weight.

Uniform preform density means even preheating, resulting in moulded pieces which are stronger and better in appearance.

Uniform preform weight allows the moulder to save material by keeping preforms to the *exact* weight needed to fill a given mould cavity. This reduces flash, and thus minimizes finishing costs.

Free from the dust and clatter of conventional preformers, Bipel Pelleters are most economical to operate. Pressure builds up only during compaction of the powder and the motors idle the rest of the time.

The main hydraulic ram compresses the powder with a steady squeeze, applying pressure evenly to both ends of the pellet. Bipel Pelleters can handle plastics considered unpelletable by conventional means, because both pressure and dwell are easily adjustable to suit any material. Accurate settings can be made in seconds.

Bipel Pelleters, made by the makers of the famous Bipel Auto-control Compression/Transfer Presses, come in three sizes—12 tons, 35 tons and 70 tons. They are compact and completely self-contained, having their own motors and pumps. *Full specifications will be supplied on request.*

max'mum pressure	12 tons	35 tons	70 tons
maximum strokes per hour	2280	1260	720
typical pellet weight*	.2—1.2 oz. (1½" dia.)	3.7—8.1 oz. (3" dia.)	8.3—18 oz. (4½" dia.)

*based on average powder density of .35 ozs. per cubic inch

B. I. P. ENGINEERING LTD.
Streetly Works, Sutton Coldfield, England

American inquiries to
Ralph B. Symons Associates, Inc.
3571 Main Road, Tiverton, R. I.

THE WHOLE STORY OF PROGRESS IN PLASTICS

OFFERED IN THESE TWO BEST SELLERS

THE MACHINE

THE TAMCO HYDRO–VAC

PLASTICS PEOPLE ARE RAVING ABOUT . . .

"No machine like it for compactness, easy maintenance and fast economical production."

"Set up your job to run automatically . . . or use the manual controls for short runs."

"Sensational new design incorporating the best features and the finest components—Wheelco Controls, Beech-Russ Vacuum Pump, Eagle Timers, Vickers Hydraulic Equipment."

Write for bulletin with *all* the details.



The only HYDRAULIC, self contained automatic unit designed for speedy, precision *Drape* and *Vacuum Forming.*

REVIEWERS REPORT

Costs 1/3 less than cast aluminum, 1/2 as much as machined metal molds; YET CHRO-MOLD IS THE SUPERIOR MOLD FROM ALL ASPECTS.

(Cr + Ni + Cu) = virtually unlimited mold life, mirror-like finish, absolute definition and resistance to abrasion.

for more profitable vacuum and drape forming.

CHRO-MOLD

a better mold...

A BETTER PRODUCT

Write for detailed bulletin on Chro-Mold.

CHRO-MOLD

TAMCO —— Exclusively Represented by the

VACUUM SALES CO.

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The boy with ideas...

THE NEW "DUTCH BOY" PLASTICIZERS	
Three Double-Duty Primary Plasticizers	
PRODUCT	**USED FOR —**
NL F-41	Outstanding low temperature flexibility Good low volatility
NL F-31	Excellent low temperature flexibility Good low volatility
NL F-21	Good low temperature flexibility Good low volatility
Four High-Purity Standard Plasticizers	
NL C-20 (Di-2-ethylhexyl Sebacate) **NL A-10** (Dibutyl Phthalate) **NL A-20** (Di-2-ethylhexyl Phthalate) **NL A-30** (Di-isooctyl Phthalate)	

You'll get ideas, too . . . once you see what "Dutch Boy" double-duty Plasticizers do for vinyls.

They're the "Dutch Boy's" newest idea . . . first primary plasticizers pre-balanced at the factory for control over *both* low temperature flexibility and low volatility at the same time. In vinyl film, sheeting, extrusions, plastisols and organosols, formulated to premium standards, they reduce cost.

Want *outstanding low temperature flexibility* plus good low volatility? "Dutch Boy" NL F-41 will give it to you. NL F-41 also imparts excellent hand and drape, good heat- and light-stability, low water extraction.

Want *good low volatility* while maintaining good low temperature flexibility? Use "Dutch Boy" NL F-21.

Want *excellent low temperature flexibility balanced with good low volatility* at moderate cost? Try "Dutch Boy" NL F-31.

...this time, it's double-duty plasticizers

Besides the three double-duty plasticizers, National Lead also makes four exceptionally pure, standard-type plasticizers. All seven conform to the high standards of the name you *know* for quality . . . "Dutch Boy."

A leader in stabilizers, too.

Twelve "Dutch Boy" Stabilizers have found their place at the top in vinyl production . . . Normasal for vinyl flooring . . . Tribase & Tribase E for electrical insulations . . . Plumb-O-Sil C for brightly colored translucent film . . . Dyphos for opaque, outdoor products . . . to name a few.

By teaming up these twelve "Dutch Boy" Stabilizers with the seven new "Dutch Boy" Plasticizers, you get a hard-to-beat group of chemicals. Write for detailed technical data . . . on your letterhead, please.

Dutch Boy CHEMICALS

*Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY
111 Broadway • New York 6, N. Y.
In Canada: **CANADIAN TITANIUM PIGMENTS LIMITED**
630 Dorchester Street, West • Montreal

HERE'S WHY MIDWEST PLASTICS CO. PLACED THEIR ORDER FOR

a fourth NRM EXTRUDER

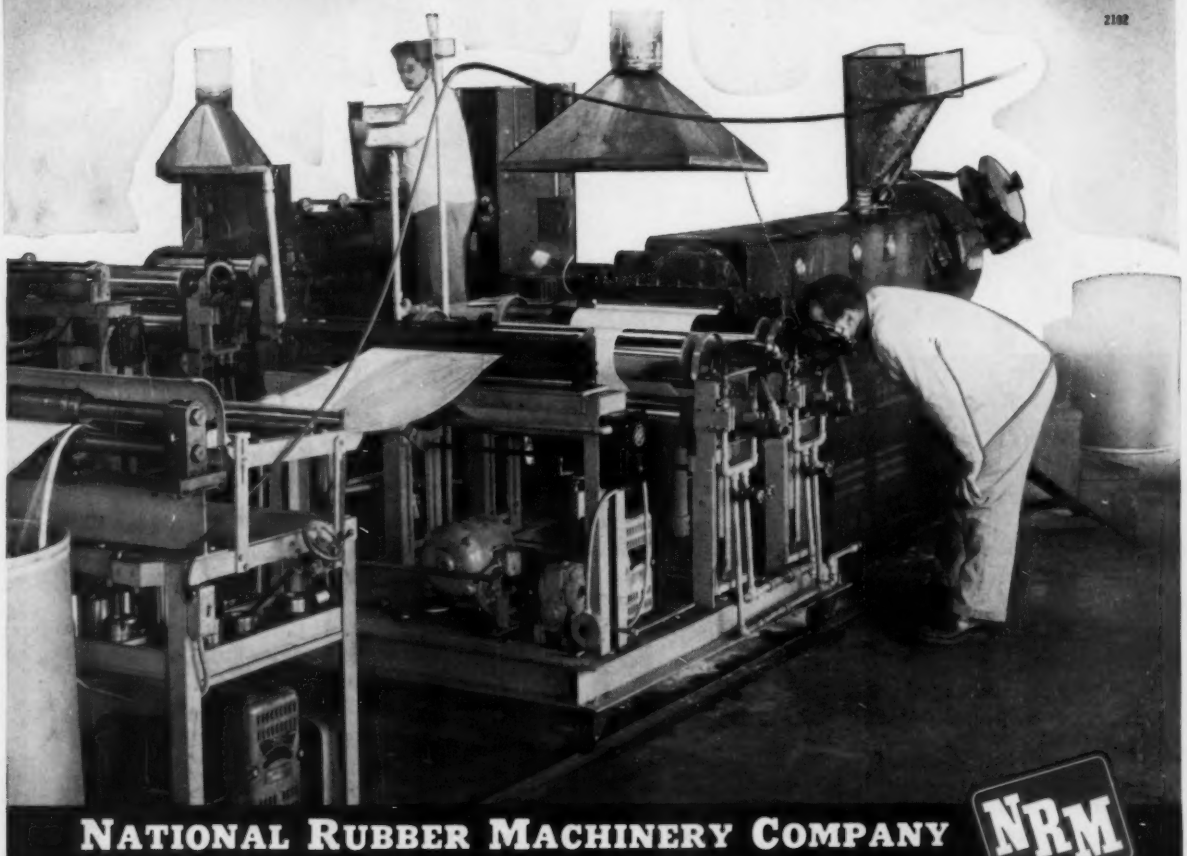
"The first extruder we ever owned was a used 2½" NRM" wrote C. C. Whitacre, President, Midwest Plastics Co., "In fact, that's how we started in business just ten years ago — on a used NRM and a short shoe string. The unfailing production from that used NRM told us better than words why NRM was tops in the field of extruders. We've just recently installed our third NRM—and placed our order for a fourth.

We're glad NRM has played a part in the growth of Midwest Plastics Co. In ten short years Midwest has become a major producer of extruded sheet plastics. Their big new plant in Chicago Heights is already beginning to look too small for their constantly growing volume.

The leaders in the field of plastics extrusion turn naturally to NRM, the leader in the field of plastics extruders. NRM built the first extruder especially designed for thermoplastics . . . designed the first electrically heated extruder . . . the "torpedo type" feed screw . . . developed balanced heat control . . . and the quick opening die gate.

Weigh this impressive record of "firsts" in extruder design, with the proved performance of NRM extruders the world over — and we're sure your next extruder will be "another NRM."

2192



NATIONAL RUBBER MACHINERY COMPANY NRM

Creative Engineering

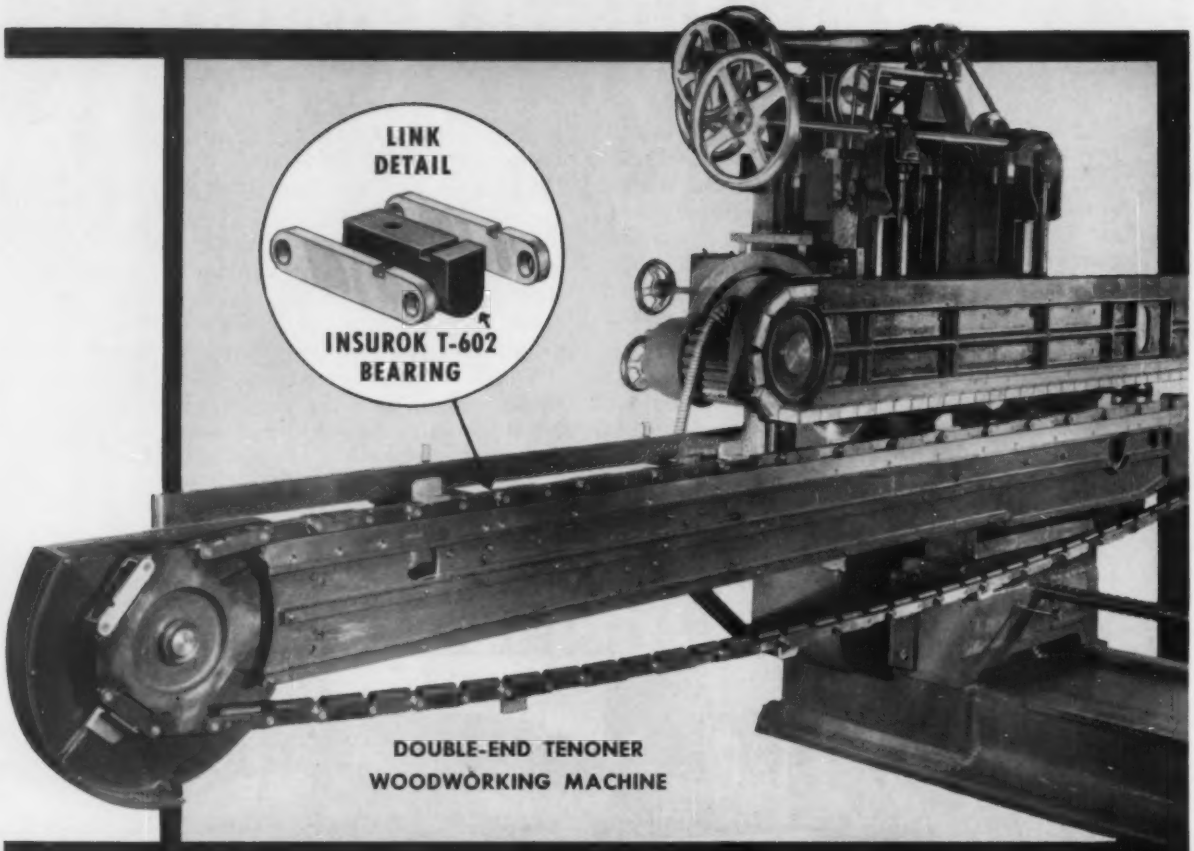
General Offices & Engineering Laboratories: Akron 8, Ohio

East: 384 Getty Ave., Clifton, N. J.

West: S. M. Kipp, Box 441, Pasadena 18, Cal.

Export: Omni Products Corporation, 460 Fourth Ave., New York 16, N. Y.

OIL STAINING ELIMINATED
with Self-Lubricating Plastic Bearings



INSUROK® T-602 replaces metal . . .
Doubles life of bearing and track

Lubricating the chain and track on this woodworking machine was formerly a difficult problem. If enough oil were provided for proper lubrication, it would drip and stain the wood. On the other hand, if the oil supply were reduced, the ever-present sawdust, woodchips, and glue particles would cause excessive abrasion and wear—shortening chain life and reducing the accuracy of the machine.

When the manufacturer replaced the aluminum bearing surfaces with inserts of INSUROK T-602—a self-lubricating graphitized phenolic laminate—the problem was solved. Since little or no oil is required, oil leakage and wood staining are eliminated. Furthermore, the life of the chain is doubled, and the accuracy of the machine is maintained.

Investigate the possibilities of this labor-saving, self-lubricating material in your product. Write or phone today for a data sheet on T-602.

Send for Bulletin, "Laminated INSUROK"

The RICHARDSON COMPANY

FOUNDED 1858

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PARAPLEX P-431 Resin

Makes These Panels Light, Rugged, Durable

The manufacturer of these panels chose PARAPLEX P-431 resin because it is easy to handle, has good color and resistance to discoloration by ultraviolet light, and is uniform from batch to batch. He also wanted the advantages of Rohm & Haas technical service.

Corrugated panels of PARAPLEX P-431 and glass fiber have other features, too. They are light, weather-resistant, translucent, strong, and durable. They can be worked with ordinary hand tools—are easy to drill, saw, or nail. They have good dimensional stability, high impact strength, and an excellent strength-to-weight ratio. But why stop with panels?

PARAPLEX resins lend themselves to a multitude of reinforced plastic products. The resins are available in a variety of grades, each designed to fit a wide range of applications. By blending one with another, special properties may be obtained which extend the range of each resin's usefulness. For example, a product can be made soft or tough, rigid or flexible. Moreover, PARAPLEX resins are adaptable to a variety of production schedules and techniques. A phone call or letter will bring you further information.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

Washington Square, Philadelphia 5, Pa.

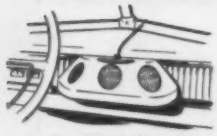
Representatives in principal foreign countries

PARAPLEX *is a trade-mark Reg. U.S. Pat. Off. and in principal foreign countries.*

FASTEST THING IN FASTENINGS®



SPEED NUTS turn up speaker "volume" with 51% time saving!



Heavy demand for the new Ezell Stereophonic Sound Speaker made it necessary for the Lone Star Plastics Company, Inc., Fort Worth, to find production short cuts. Produced for the Bishop-Green Manufacturing Company, Dallas, this in-a-car speaker for drive-in theatres was assembled with 15 SPEED NUT brand fasteners. The result: faster, easier assembly with savings of 51% in time, 34% in material costs!

Push-On type SPEED NUTS are used in the installation of the three speakers, handle and hanger wire. These one-piece fasteners eliminate costly threaded parts, are self-locking to provide a bite-lock on smoothest, hardest surfaces. Tubular type SPEED CLIPS fasten the speaker case to its base. They snap in place by hand, are self-retained in stud-receiving position.

Chances are similar SPEED NUT savings can be made in your own product assemblies. Call your Tinnerman representative for complete details!



PUSH-ON SPEED NUT



TUBULAR SPEED CLIP

The use of SPEED NUT brand fasteners results in substantial savings in assembly time, cost of materials, and materials handling. For example, SPEED NUTS eliminate costly threaded inserts, make faster, easier attachments in blind locations and permit greater design flexibility. A complete range of types and sizes available.

Send for your copy of SPEED NUT "Savings Stories," and descriptive literature on the above fasteners. TINNERMAN PRODUCTS, INC., Box 6688, Dept. 12, Cleveland 1, Ohio. *In Canada:* Dominion Fasteners Ltd., Hamilton, Ontario. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S. A.—7 rue Henri Barbusse, Levallois (Seine).



INJECTED or EXTRUDED



PECO MAKE THE MACHINES -THAT DO THE JOB

Peco Injection Moulding Machinery is now well established throughout the world as equipment in which the best engineering skill and experience are combined with the latest developments in plastic technology.

A recent addition to the PECO range of machines for the plastics industry is the 2½" Universal Extrusion Machine which is illustrated above. This machine aroused much interest at the 1953 Plastics Exhibition in London.

Illustrated literature is available on all PECO products and will be gladly sent on request.

PECO PRODUCTS

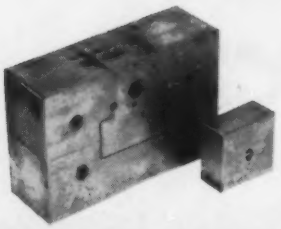
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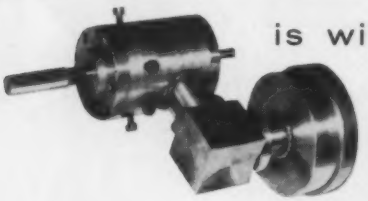
Telephone: ABBey 1793/4/5 Telegrams: PROFECTUS, SOWEST LONDON Cables: PROFECTUS LONDON

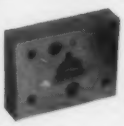
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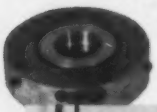
THE PROJECTILE & ENGINEERING COMPANY LTD ACRE STREET, LONDON, S.W.8



THE RIGHT BEGINNING for any extrusion, large or small is with a ROBBINS DIE







. . . and we're ready to prove that it pays to buy extrusion dies from a specialist. Write for an estimate—dozens of companies (domestic and foreign) have switched to Robbins. No obligation, of course. You can phone us at 2-4060 Elkhart, Indiana.

Our engineers have designed hundreds of extrusion dies. They're specialists. That's why a Robbins die generally costs less . . . and invariably have a greater yield!



DESIGN

Single orifice to complicated sheeting or pipe dies, Robbins tools every job to perfection. Die makers with years of experience and the newest in machine tools build the dies that answer your extrusion problems.



MANUFACTURE

Final polish, assembly and inspection are specialist operations, too. Here, again, specialization pays off in quality and performance of every Robbins built die.



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When a Robbins die is delivered, you know it's right. Because we test it—prove it—by submitting samples from a test run in our own plant. In addition, our engineers are available to help you set up your job.



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Robbins
never say die . . . say Robbins die

TOOL AND DIE COMPANY
1430 Mishawaka Street, Elkhart, Indiana

Tough, lightweight Plastic **expands** into shape

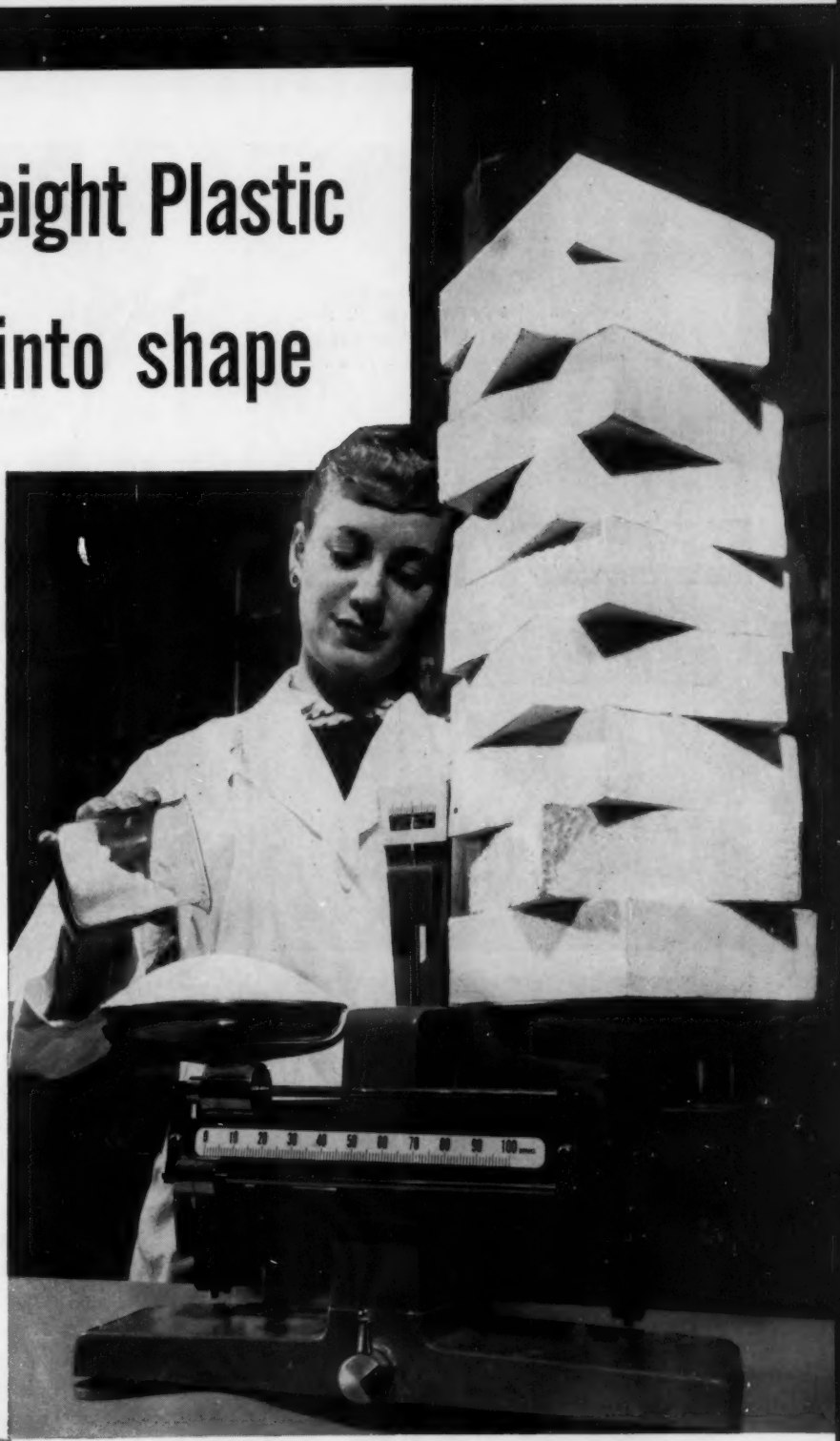
A handful of Koppers Expandable Polystyrene will foam into millions of small bubbles when heated. Pour some grains of this polystyrene into a mold of any shape; apply heat and the plastic will expand to fill the entire cavity. Polystyrene foam creates a tight network of small cells, all fused together to make a strong, tough mass. Products made this way are light, rigid and smooth. Then too—they float.

Koppers Expandable Polystyrene makes a fine insulation. The millions of tiny cells trap air and retard heat flow. This plastic *keeps* its insulating value, since it is unaffected by moisture.

Expandable polystyrene has a smooth surface that you can paint.

Koppers Expandable Polystyrene can be used in refrigerators, freezers, life buoys, toys, packages, sandwich building panels and displays. It is the right choice wherever lightweight, strength, insulation, buoyancy, low water absorption, and smooth, precisely molded features are important. Remember, Koppers Expandable Polystyrene is shipped in beads. As a result your freight savings may be as high as 60% of the shipping cost of expanded polystyrene planks and logs.

For more information about Koppers Expandable Polystyrene write for our 26 page booklet today.



Molding is easy. A simple machine is all that is needed to expand this new polystyrene into sheets, blocks, or intricate shapes. The molding operation takes but a few minutes.





Making a mountain out of a molehill. This small pile of polystyrene granules has been foamed up to about 30 times its original size. It can be molded into any shape you need.

KOPPERS COMPANY, INC.
Chemical Division
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Koppers Plastics Make Many Products Better and Many Better Products Possible

KOPPERS®

Koppers Plastics

The cutter and tracing head of this CINCINNATI 8" x 18" Tool and Die Miller has been swiveled a few degrees to mill corners and the straight walls in a mold for a plastic handle.

IT REACHES THE TOUGH CORNERS

and ELIMINATES A LOT OF HAND FINISHING



Right: Drawing of plastic toaster handle. The mold for this part is being milled on the equipment illustrated above.



CINCINNATI 8" x 18" Tool and Die Milling Machine. Catalog No. M-1731 contains complete specifications. Write for a copy.

● Hard-to-get-at corners of a mold need not be such a big factor in the cost of hand finishing. Clean them out accurately on the die-sinking machine, and you will see hand finishing costs drop sharply. This is one of the advantages offered by CINCINNATI 8" x 18" Tool and Die Millers. For milling open-end square corners, the cutter spindle and tracing head may be swiveled as a unit 15° front or 35° back. ¶ Tracing and milling then proceed in the usual manner. The setup above illustrates this feature in milling a mold for a plastic handle. Other CINCINNATI 8" x 18" features are equally important in making plastic molds: handwheel table traverse with anti-friction screw; light pressure, automatic tracing; integral slotting attachment, if desired. Complete data may be obtained by writing for catalog No. M-1731.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CINCINNATI

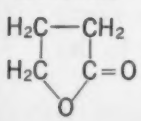
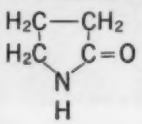
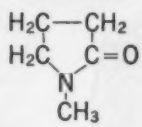
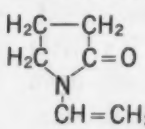
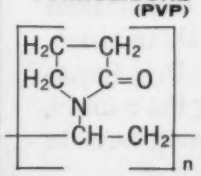
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FOR HIGH PRESSURE ACETYLENE DERIVATIVES

to be on stream by the end of 1955

the following products are among those which will be available in commercial quantities

PROPARGYL ALCOHOL $HC{\equiv}CCH_2OH$	Three centers of reactivity. Chemical intermediate for pharmaceuticals, agricultural chemicals, etc. Corrosion inhibitor and stabilizer for halogenated compounds.
PROPARGYL HALIDES $HC{\equiv}CCH_2X$	Three centers of reactivity. Chemical intermediate for terpenes and pharmaceuticals, etc. Agricultural uses as soil fumigant, etc.
2-BUTYNE-1, 4-DIOL $HOCH_2C{\equiv}CCH_2OH$	Reacts as a glycol and di-substituted acetylene. Chemical intermediate for solvents, plasticizers, plastics, etc. Corrosion inhibitor and stabilizer for halogenated compounds.
1,4-BUTANE-DIOL $HOCH_2CH_2CH_2CH_2OH$	Reacts as dihydric alcohol. Chemical intermediate for polyesters, polyurethanes, polyamides and cyclic compounds. For plasticizers, resins, fibers, etc. Solvent and humectant.
BUTYRO-LACTONE 	Powerful organic solvent for polyacrylonitrile, cellulose acetate, polystyrene, etc. Selective solvent for acetylene in natural gas. Chemical intermediate for aliphatic and cyclic compounds.
2-PYRROLIDONE 	Polymerizes to high molecular weight, linear, nylon-type, polyamide condensation product. Gives γ-aminobutyric acid and derivatives, also N-acyl lactams.
N-METHYL-2-PYRROLIDONE 	Powerful organic solvent for acrylonitrile polymers and copolymers, cellulose triacetate, etc. Selective solvent for acetylene in natural gas. Spinning agent for polyvinyl chloride solution.
N-VINYL-2-PYRROLIDONE 	Will copolymerize with almost all vinyl monomers. Permits modification of many properties in existing homopolymers. Gives control of hydrophobic and hydrophilic properties of products.
POLYVINYL-PYRROLIDONE (PVP) 	Binder, stabilizer, detoxifier, protective colloid, thickener, film former. Physiologically compatible. Wide solubility range. For use in pharmaceuticals, cosmetics, foods, detergents, dye stripping, synthetic fiber additive, size component, lithography, agricultural chemicals, etc.

Until the new plant at Calvert City, Kentucky, is completed, these products are available in quantities up to tank cars from the GAF pilot plant and semi-works at Linden, N. J.

For technical information, price schedules and samples write to:

GENERAL ANILINE & FILM CORPORATION

COMMERCIAL DEVELOPMENT DEPARTMENT

435 HUDSON STREET, NEW YORK 14, N. Y.

gaf

From Research to Reality

Interior of new Road-Runner shows smart, practical U.S. Royalite ceiling panels from rack to rack. Note how few seams are required.



Lightweight Ceiling Panels that take to the road ...another case for U.S. ROYALITE!



Modern, functional *design* demands modern, functional *materials.* So it's little wonder Fitzjohn's expert designers have chosen U. S. Royalite, the versatile thermoplastic, for a large portion of the interior of their sleek new inter-city bus.

Like many other manufacturers, they've found U. S. Royalite offers a combination of advantages no other material can match. In the Road-Runner, versatile U. S. Royalite performs a dual job: lining the ceilings, and incorporating air conditioning ducts. In their own words:

"We chose U. S. Royalite for this application because of its easy fabrication quality, its light weight, and its durable, lasting finish, resistant to scuffing and easily cleaned. We felt it to be an ideal material for the purpose described and far superior to other materials that might have been used and which previously have been used in buses for headlining panels."

Colored clear through, in textured or plain finishes, non-warping, tough, and resistant to weather and most chemicals, versatile, decorative U. S. Royalite may well be just the material *you've* been looking for. Better find out more about the *many* advantages it offers you by writing to the address below.

U.S. ROYALITE®
TOUGH PLASTIC PRODUCTS

US RUBBER

UNITED STATES RUBBER COMPANY
ROCKEFELLER CENTER, NEW YORK

3 FINE STEELS for MACHINED CAVITIES



The master die shown in upper part of illustration is being reproduced in a duplicate machined-cavity mold, made of BTR. This manganese-chromium-tungsten steel is safe-hardening, and has high wear-resistance.

	Hobability	Machinability	Core Strength	Wear Resistance	Distortion in Hardening	Application Pressure and Temperature
MULTIMOLD	Fair	Best	Fair	*Fair	Fair	Medium
BTR	Fair	Good	Good	Good	Good	High
A-H5	Poor	Fair	Best	Best	Best	High

*Good, when carburized and hardened.

MULTIMOLD is a balanced-alloy die steel, furnished either annealed or heat-treated. It's an easy steel to machine, even when heat-treated to 300 Brinell, and it can also be welded, providing good practice is used. Multimold combines high physicals, resistance to shock, and wear-resistance, making it an ideal steel for low temperature die-casting or plastic molding dies. If machined from the annealed condition, it may be heat-treated by quenching and tempering, with little danger of cracking or excessive decarburization. If a higher surface hardness is required, Multimold may be carburized and quenched, developing excellent surface hardness and core properties.

BTR is our standard grade of manganese-chromium-tungsten oil-hardening tool steel. The great thing about this grade is its safe-hardening quality. BTR is fine for long-run dies where the requirements are low distortion in heat-treatment, deep-hardening, and high wear-resistance. It's both easy to machine and easy to heat-treat. Dies made of BTR should only be machine-cut, except for very shallow cavities, which can be hobbed.

A-H5 an air-hardening tool steel with a 5 pct chromium content, is a wise selection where maximum wear is desired for dies, with a minimum of size-change in heat-treatment. Wherever maximum abrasion-resistance together with minimum distortion is required, A-H5 is the first choice. Dies of A-H5 should be machine-cut, since hobbing with this steel calls for exceptional skill and in any case only very shallow cavities are obtainable.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM TOOL STEELS

BETHLEHEM STEEL

POLYESTER RESINS SERVING INDUSTRY FOR 13 YEARS



Polyester SUPER MARKET

The modern super market has created a merchandising revolution by providing a wide range of low cost, quality merchandise and a one-stop shopping trip for the busy customer.

When one is shopping for Polyester Resins, there is no need to look farther than Interchemical. In this big polyester super market the fabricator of reinforced plastics can fill his every need.

IC Polyester Resins are available in a wide range of viscosities and curing cycles to meet varying production conditions.

IC Polyester Technicians, with a background of thirteen years experience in solving polyester fabricating problems, offer you a technical service that is without an equal in the industry.

IC Polyester products include:

RIGID RESINS
FLEXIBLE RESINS
RESILIENT RESINS
LIGHT STABLE RESINS
EMULSION BINDER RESINS
HIGH HEAT DISTORTION RESINS
FIRE RETARDANT RESINS
NON-AIR-INHIBTED RESINS
MATCHED METAL MOLD RESINS
STABILIZERS
FILLED RESINS
POTTING AND IMPREGNATING COMPOUNDS
ACTIVATORS
PARTING AGENTS

plus eighteen pre-dispersed pigment concentrates to provide a rainbow of hues.

WHY NOT JOIN THE TREND TOWARD INTERCHEMICAL SO THAT YOU, TOO, MAY ENJOY THIS COMPLETE ONE-STOP POLYESTER SERVICE?

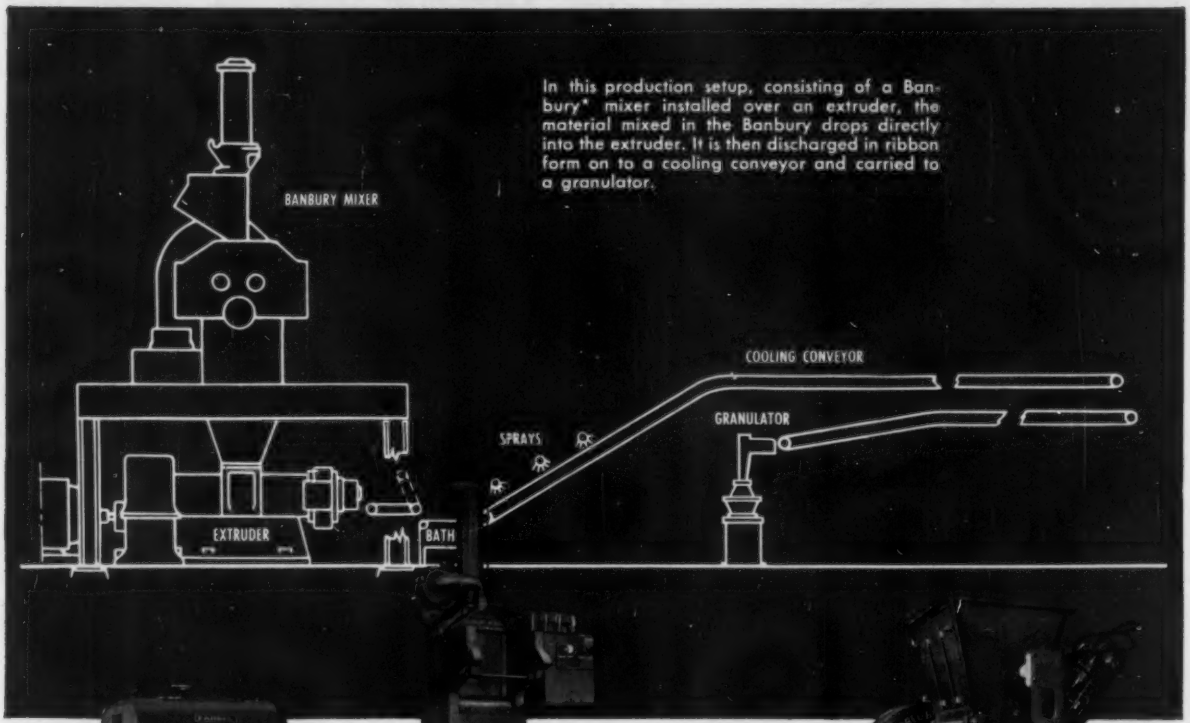
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Finishes Division

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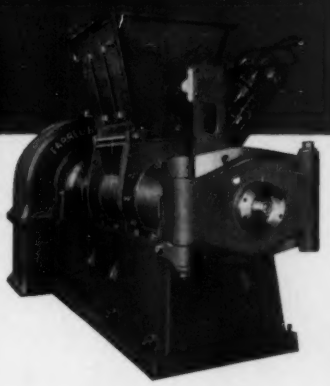
SIMPLIFIED, IMPROVED method of producing plastic materials in granular form



In this production setup, consisting of a Banbury* mixer installed over an extruder, the material mixed in the Banbury drops directly into the extruder. It is then discharged in ribbon form on to a cooling conveyor and carried to a granulator.



Banbury* mixers, widely used in the production of plastics, produce uniformly mixed stocks. They are made in a range of standard sizes to suit any capacity requirements.



Farrel - Birmingham extruders can be built for any capacity and provide the ideal answer to full utilization of maximum Banbury output.

The highly efficient processing system blueprinted here, has been installed by a number of large chemical companies to process plastics in preparation for granulation.

Operation is from a central control panel, and a continuous, even flow of production is maintained at all times by automatic cycle control of the Banbury* mixer, with extruder feed regulated to suit the cycle. The material is mixed and blended in the Banbury, and then delivered in chunk form to the extruder, where the stock is further worked by screw action under close temperature control. An air-operated ram in the hopper automatically provides constant feed to the screw. A continuous strip is extruded from the die head through a water bath to a conveyor, where the material is further cooled on its way to the granulator.

Another application for this production setup is for the reclaiming of vinyl scrap. The scrap is mixed and blended in the Banbury, then discharged into the extruder, where it is strained and extruded in strip form for subsequent cooling and granulation.

Send for further information.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®

*Trade-mark
FB-941

Sock performance



CYCOLAC®

THE *New* HIGH-IMPACT
THERMOPLASTIC RESIN

TEES OFF on Production Costs

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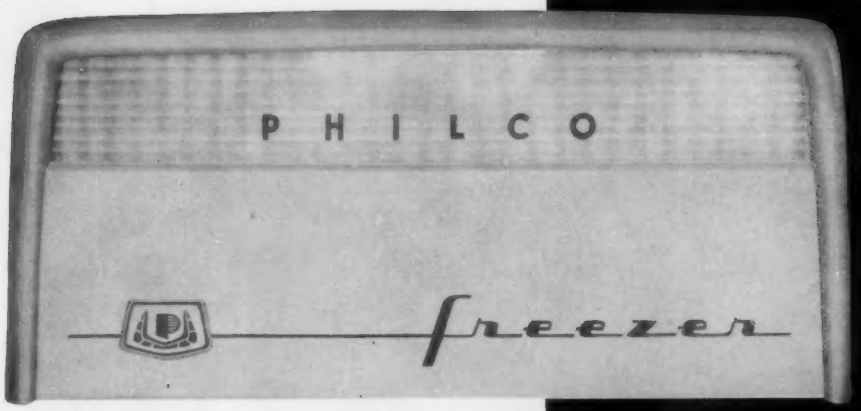
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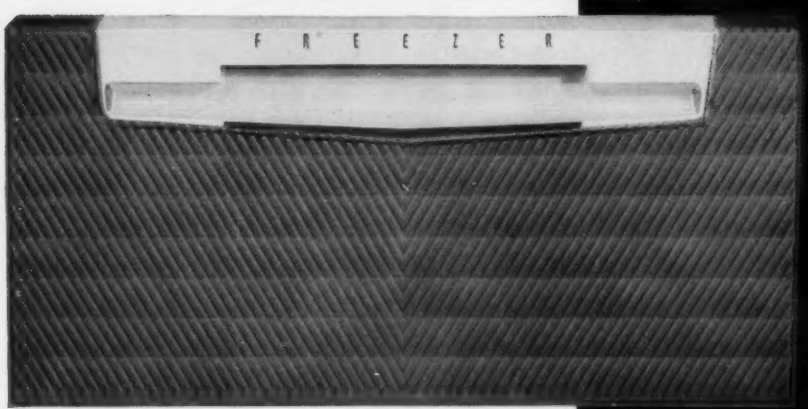
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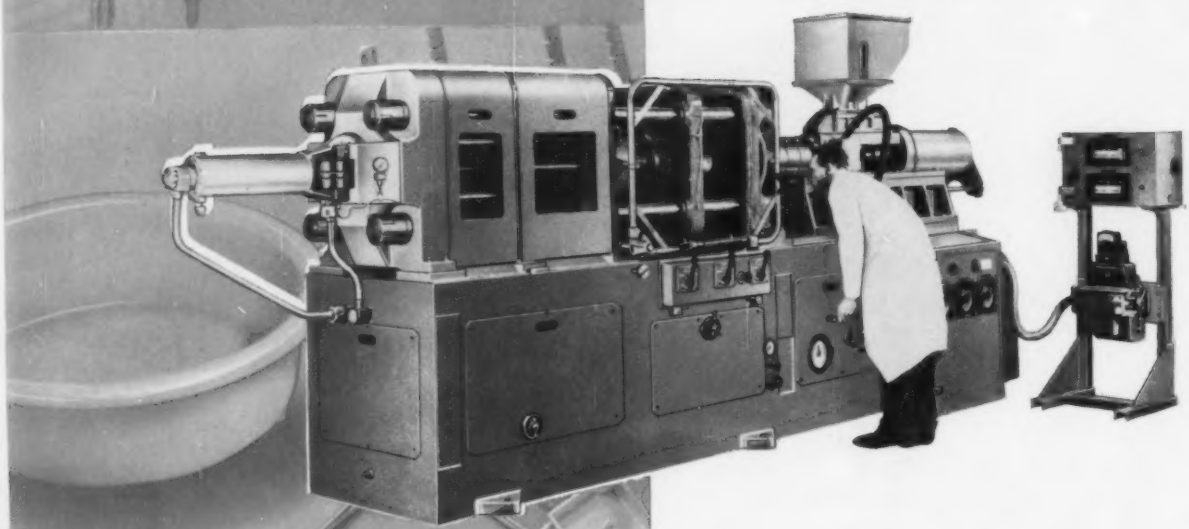
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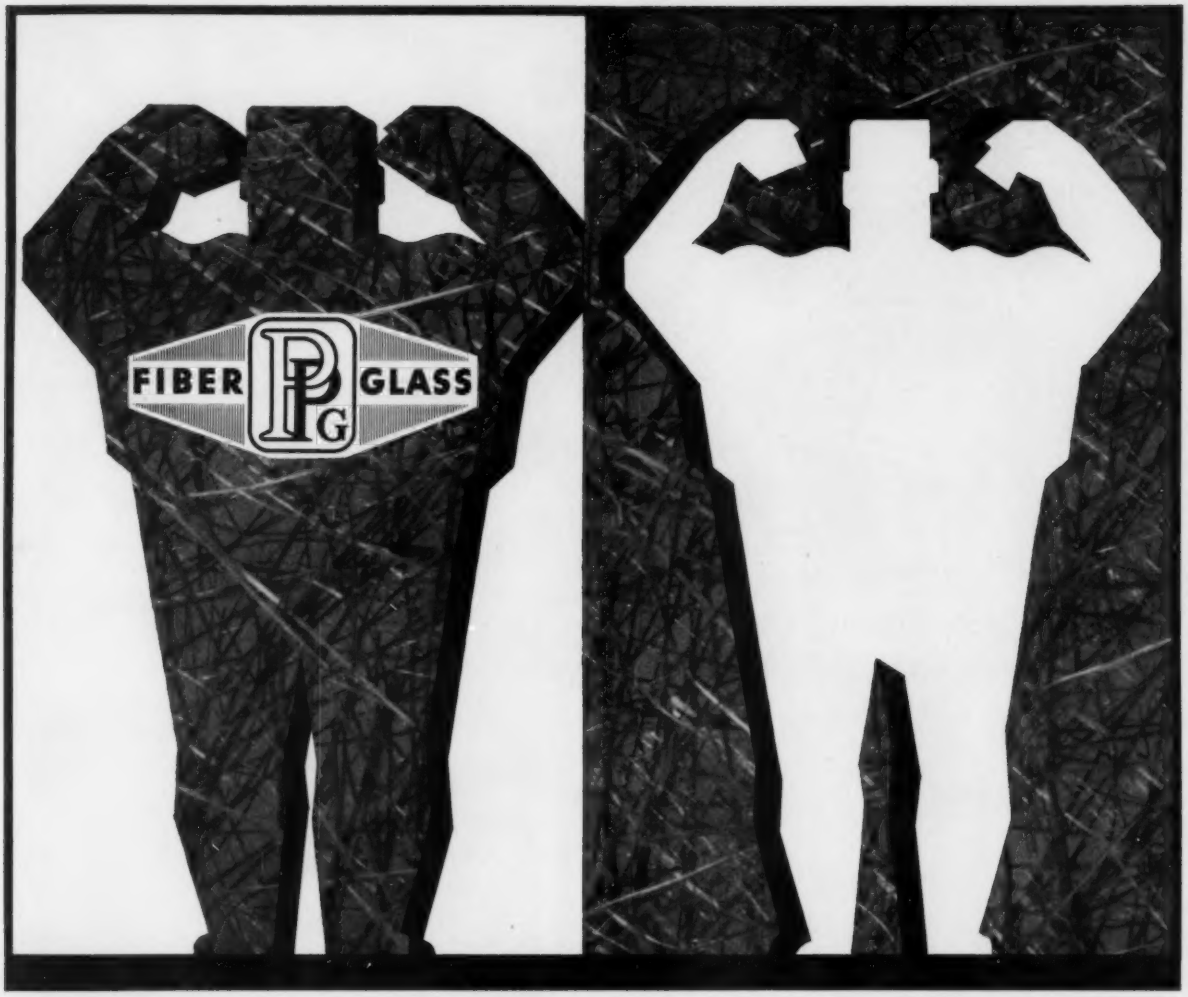
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MODERN PLASTICS

OCTOBER 1954 VOLUME 32 NUMBER 2

In February 1944, only a handful of molded polyethylene products were available to illustrate the first feature article on the material to appear in MODERN PLASTICS (right). Today, molded applications, such as those shown on the following pages, have increased in number to the point where they are expected to absorb a major share of the ½ billion lb. of polyethylene that will probably be produced in 1955



The ice cube tray, ice tray, shoetree, collapsible tube, wire insulation, tubing, bottle stopper and injection-molded ornaments show some possible future uses for polyethylene. Present production is subject to war allocations

Polyethylene—a new thermoplastic

by DR. J. W. SHACKLETON*

THE year 1943 saw the beginning, in this country, of the production, for war purposes, of commercial quantities of a new plastic which possesses a remarkable combination of useful properties. This is the hydrocarbon resin, polyethylene, made by the polymerization of ethylene.

1944

1954—FASTEST GROWING PLASTIC

A pilot plant curiosity only 10 years ago, polyethylene promises to become in the next decade our first billion-pound-per-annum plastic. Specialized design and proper molding methods will contribute much to its growth

THE ½ billion-lb. production capacity which is expected for polyethylene by the end of 1955 has already resulted in an unprecedented surge of demand for the material by manufacturers of both consumer and industrial products.

With this increase in supply — and the price reductions which may follow — many manufacturers who have previously had to content themselves with using polyethylene on an allotment basis are going to have their first real crack at the material. And evidence points to the fact that the results are going to exceed by far the exciting potential predicted for polyethylene back in



Evolution of a Polyethylene Product

BY taking full advantage of properties peculiar to polyethylene, an effective combination bulb and stopper was designed to replace the familiar rubber bulb and quill assemblies used with bottles of drawing inks. The unit, which incorporates a molded styrene pipette, is being molded by Injection Molding Co., Kansas City, Mo., for the Higgins Ink Co.

Polyethylene was specifically chosen for this application because of: 1) its high degree of transparency in thin wall sections; 2) its flexibility; 3) its compressibility and quick recovery in squeeze applications; 4) its ample stiffness to provide virtually rigid sections where desired; and 5) its ready adaptability to difficult molding techniques.

The success of the product lies in the fact that each of these properties was put to its natural use. The wall thickness of the bulb section, for example, was engineered to serve a two-fold purpose. First, because of its transparency, ink drawn up into the bulb can be positively identified as to color. Secondly, the flexibility of the thin wall affords a quick drawing and dispensing action which eliminates the drip and mess of the old style quill applicator. Flexibility also permits the styrene pipette to be easily snapped into place inside the stopper for a leakproof fit.

Compressibility of the material is brought into play in the design of the corking section which was engineered to effect a snug, leakproof seal when inserted in the bottle. Stiffness of polyethylene in heavy wall sections, coupled with a series of supporting ribs, provides sufficient rigidity in the skirt of the stopper to assure easy removal of the unit from the bottle of ink.

Finally, the ability of polyethylene to conform to unusual molding techniques actually made the unit possible in its present form. Quite naturally, mold design and molding procedure were directly affected by the characteristics listed above, as well as by the other variable factors involved in working with polyethylene. The design of the mold for the bulb section, for example, includes floating cores which move inside of independently floating sleeves. Because of the undercut ring on the inside of the corking section which provides a snap-stop for the styrene pipette and because of the expanded ring on the outside of the corking section which contributes to the sealing effectiveness of the stopper, this mold design was necessary to permit the piece to be ejected from the mold. Final ejection is accomplished by the movement of a series of central pins which are part of small individual pistons working in reamed cylinders in the ejector plate.

Correct cylinder and mold temperatures, proper working pressures, and optimum cycling time were also taken into account in planning the molding operations.

the days when limited amounts of the material were dribbling into non-military applications.

Increased Production

During the first 10 years of its existence (see illustration, p. 91,) polyethylene has secured a permanent place for itself in a limited number of applications, principally electrical insulation, packaging, and housewares. With the anticipated increase in supply, the door is opening wide. All indications are that the next decade will see enough new applications being introduced to assure a ready market for the ½ billion lb. of material that will be available annually.

In the light of current activity in the field, the ½ billion figure may be considered simply as a mark to aim at. There is a good chance that the total may be even higher, once all those companies that have announced their intentions of beginning production on polyethylene perfect their plans (see "Plastiscope," MODERN PLASTICS, *31*, 226, Aug. 1954). Included among these potential producers are: Allied Chemical and Dye Corp.; The Dow Chemical Co.; Eastman Chemical Products, Inc.; Koppers Co., Inc.; Monsanto Chemical Co.; National Petrochemicals Co.; Phillips Petroleum Co.; and Spencer Chemical Co.

The two current suppliers of polyethylene in this country, Bakelite Co. and E. I. du Pont de Nemours & Co., Inc., have already announced substantial increases in production for 1955. Bakelite expects to have a production capacity of 250 million lb. a year or more by the end of next year, and Du Pont expects to be in the 100 million lb.-a-year production category by the same time.

Some estimators predict that, by 1960, annual polyethylene production should be well over the 600 million lb.-per-year mark, and, if progress continues at its present pace, there is a chance that by the time the third decade in polyethylene's history rolls around, the material will have become our first billion-lb.-per-annum plastic.

Molded Applications

Just which applications are going to absorb how much of the material is anybody's guess. Extruded polyethylene wire and cable coverings

will doubtlessly continue to account for large quantities of the material. Squeeze bottles are actually still in their infancy. Transparent, tough polyethylene film is only now beginning to have a major impact in many industries. And polyethylene coatings seem certain of enhancing the utility of more and more varieties of cloth and paper surfaces.

It is agreed, however, that one of the biggest outlets for polyethylene will probably be in molded applications. In only one phase of such applications, molded housewares, for example, a spokesman for Bakelite Co. predicts that "by 1960, housewares manufacture will consume about 20% of the total annual production of polyethylene." In 1954 alone, the amount of polyethylene used in housewares will probably triple and new estimates, based on the increased availability of the material, point toward a nine-fold increase in consumption by housewares manufacturers during the next five years.

To exactly what extent all molded polyethylene products will find a market will, of course, depend a great deal upon the sound judgment displayed by product designer, manufacturer, and molder in using the material. In many respects, polyethylene is the easiest of all thermoplastics to mold. It has a wide molding range, exhibits excellent flow characteristics, and is not sensitive to moisture. As one molder put it, "it is almost difficult to mold a bad product of polyethylene."





Molded polyethylene drain tray (top) measures 15½ by 20 in., yet weighs less than one pound. Ridges molded into tray's underside (below) help keep it from slipping on wet sink tops

Courtesy Bakelite Co.

The simplicity of molding, however, is a two-edged sword. On the other side of the fence, Earl S. Tupper, president of Tupper Corp., pioneer molders of polyethylene, once remarked that, "polyethylene holds a brilliant future for molders who are builders rather than scavengers." While it may be difficult to mold a bad product of polyethylene, it is the "optimum" polyethylene product — the one that is soundly designed for the material and not simply an inexpensive carbon copy pushed quickly on the market in the hope



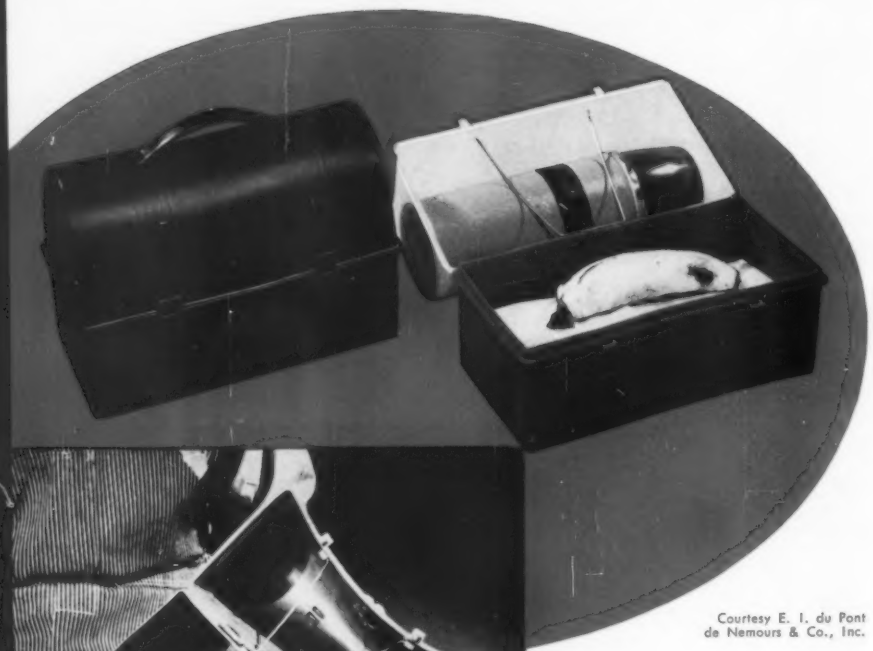
Thin strip of polyethylene connecting the two halves of molded one-piece drill case serves as integral hinge

Polyethylene wastebasket—flexible enough to be squeezed into tight spaces (left) or pinched to form pouring spout (right)—exemplifies trend toward larger molded products

Courtesy Bakelite Co.





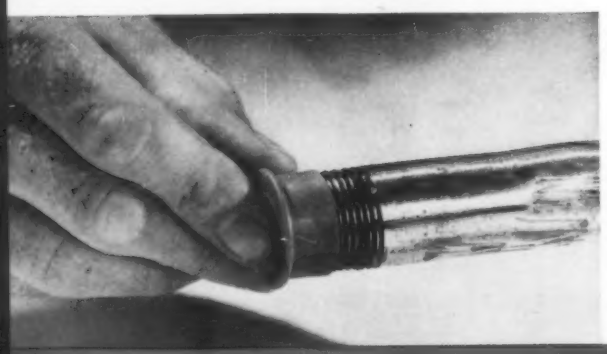


Courtesy E. I. du Pont de Nemours & Co., Inc.



Courtesy Bakelite Co.

Front of hinged cover for polyethylene lunch box is fastened to the base with two molded-in clasps similar to conventional metal hasps. If squeezed, box flexes without denting (left)



The ease with which polyethylene can be molded is used to advantage in designing caps for protecting open ends of pipes and tubes



Internal (top) and external (bottom) flexible threads insure quick fitting and are relatively easy to mold

Courtesy Bakelite Co.

of reaping a quick profit — that will insure for the material the rich future it deserves.

Optimum design in polyethylene calls first for the conception and development of a product expressly to take full advantage of the properties peculiar to the material and secondly for the utilization of correct molding techniques to transform the conception into a finished product.

Product Design

Polyethylene has much to recommend it for a wide variety of applications. It is free from taste, odor, and toxicity; it is flexible at temperatures from as low as −80 to −100° C.; it is fairly rigid in thick wall sections; it has low moisture-vapor transmission; it has excellent recovery in squeeze applications; it is resistant to most chemicals, solvents, and greases; it has a specific gravity of 0.92; it has good dielectric characteristics; and it has excellent tear strength and over-all durability.

Even long-term outdoor durability can be attained with the versatile polyethylene resin when it is properly compounded.

Once polyethylene has been selected as the molding material for a given application, it is important for the molder to determine which of the many polyethylene resins now commercially available will be the proper grade or type to give the best performance in a particular application.

Polyethylene resins are produced in a wide range of molecular weights, all of which have a similar characteristic structure. From the standpoint of the molder, material in the 19,000 to 21,000 molecular weight range is preferable. When molecular weight goes over the 26,000 range, the material becomes more difficult to mold.

Flow behavior, as indicated by melt index, is a measure of molecular weight and has been used as a basis for grading the various resins. Resins of low molecular weight change from solids to soft plastic masses and, while never reaching the fluidity of paraffin, melt sufficiently to be useful as hot melts. The high molecular weight resins remain quite viscous even above the melting temperature range.

Flexibility of the molded polyethylene product is affected more by

wall thickness of the parts than by variations in molecular weight. In thin sections, polyethylene is quite flexible, although it lacks the limp or rubbery characteristics of other non-rigid plastics; in thick sections, it is stiff enough to be classified as a semi-rigid material.

Also of interest to the future user is irradiated polyethylene. Through a process developed by Chemical Div., General Electric Co., the softening temperature of polyethylene can be radically increased by bombarding the material with electrons. (See "Irradiated Polyethylene," MODERN PLASTICS, *31*, 100, Apr. 1954).

Engineering Considerations

Even though the engineering considerations for polyethylene often may be less critical than for other plastics, there is no substitute for good engineering judgment in designing an optimum polyethylene product.

For example, it is essential that certain polyethylene products be designed on the basis of the stress system under which they are to function. Of particular importance is an understanding of the difference in creep characteristics of biaxially stressed and uniaxially stressed polyethylene. Failure to comprehend this difference and to design articles for service under biaxial stress may result in misapplications of the finished product.

Among other polyethylene design considerations which should be taken into account is the fact that the material is the only known solid plastic with a density less than that of water. In many applications, this can result in significant savings in the weight of finished articles and in the amount of material needed to mold it.

The fact that unpigmented polyethylene has only fair weathering resistance need not be a serious problem. For those applications where weathering is important, polyethylene can be given satisfactory resistance to sunlight (approximately 30 years) by incorporating from 2 to 3% of a well dispersed channel black having a particle size of 25 millimicrons or less.

Finally, because of the characteristics of the material and the ease with which it can be molded, the manufacturer is afforded a great deal more of flexibility in intricate prod-

Molding Techniques: Mold Design

WORKING with polyethylene, molders should evaluate the relative importance of the various factors involved in molding the material—mold shrinkage, flash, quality of surface, ease of ejection from the mold, and cycle. A consideration of these points will determine optimum mold temperature, cylinder temperature, and injection pressure.

Molding (cylinder) temperature—Polyethylene can be molded at cylinder temperatures from 300 to 500° F. In some cases, however, depending upon the end results desired, temperatures can run as low as 250° F. and as high as 600° F. A molding temperature of 450 to 500° F., coupled with a high mold temperature, is recommended to obtain maximum low-temperature flexibility and to minimize orientation in the molded item. High cylinder temperature minimizes shrinkage and improves surface finish. Low cylinder temperature results in less tendency to flash and makes possible easier ejection and reduced cycle.

Mold temperature—A mold temperature of 110 to 130° F. is suggested for maximum gloss. To obtain minimum cycle time, a lower temperature is recommended. A low mold temperature and cylinder temperature may be advisable for minimum cycle time and low unit cost, where conditions warrant use of the lower temperatures.

Mold design—The use of a well designed, well machined mold will greatly reduce flashing—a difficulty that is sometimes encountered when molding polyethylene.

Molds should be designed to permit both halves to be cored for circulating fluids, so that temperature can be controlled at the cavity surfaces. This temperature may range from 70 to 130° F. Molding of dissimilar articles in one mold and the use of unbalanced mold layouts should be avoided.

Wall thickness—Wall sections as thin as 0.025 in. can be molded, depending upon the size of the molding. The design of the knockout should take into consideration the flexibility of the plastic in such thin sections. It is generally better to pull or blow a thin-walled piece from the mold, since pushing it may cause buckling. Cavities should be adequately vented to facilitate molding at the lowest injection pressures. Sticking in the mold of complicated shapes often can be overcome by etching or vapor-blasting the surface of the mold.

Shrinkage—Shrinkage of the piece of polyethylene in the mold is generally from 2 to 3% (20 to 30 mils per in.), depending upon the molding conditions and thickness of the molded piece. Thin sections show less shrinkage than thick sections. Shrinkage increases as mold temperature increases. As a rough approximation, an increase of 20° F. in mold temperature increases shrinkage by 0.002 in. per inch. Shrinkage can be reduced by higher cylinder temperatures, higher plunger pressure, and longer plunger dwell.

Short dwells are recommended to minimize sticking in the cavity. Care should be taken, however, to prevent dwells that are too short, resulting in shrink voids.

Gates—A gate measuring 0.015 by 0.040 in. or larger is recommended for best results. Gates as small as 0.005 to 0.010 by 3/32 to 7/32 in. have been tried out and result in higher gloss in the molded piece, although usually making mold fill-out difficult and promoting the appearance of sink marks in the piece.

Fillers—Materials that serve as fillers can be used in quantities up to 40 percent. Calcium carbonate and clay have been used. Filled compounds require up to 35% higher injection pressure. Stiffness has been increased up to 100% by the use of 40% filler.

Hot-runner molds—Polyethylene is probably the most suitable of the thermoplastics for use in hot-runner molds (usually operated at about 280° F.), eliminating the recycling of sprues and runners.

Injection machine ratings—Since polyethylene has the lowest specific gravity of all moldable plastics, 0.92, machine ratings will be lower than for heavier plastics, e.g. 1-oz. machine rating for polystyrene compares with 0.88 for polyethylene.



Courtesy Plastray Corp.

Because of supporting ribs and thick walls, polyethylene cake tray cover (left) is sufficiently rigid to serve as the base when the double-purpose unit is used as a bread box (right)



Courtesy The Poly-Seal Corp.

Flexible sleeve molded into polyethylene lining slips easily over protruding stud in phenolic cap. Quick recovery of material enables lining to grip the stud for a tight locking action



Courtesy Bakelite Co.

Molded polyethylene counter, which can bend easily without breaking, is securely bonded into the back section of shoes with a specially formulated polyethylene-to-leather adhesive

uct design. Such involved design features as tricky undercuts, molded-in threads, etc., offer little problem when working with polyethylene.

Once the special techniques for designing and molding polyethylene parts are understood, the results can indeed be gratifying. A survey of a few recent applications will serve to indicate the possibilities.

Drill Case

A typical example of the way in which the advantages of polyethylene can be put to good use in the design of a product and the limitations of the material not only overcome but actually put to work, is an all-polyethylene package for high-speed metal drills. The unit is molded by Prolon Plastics, Div. Prophy-lac-tic Brush Co., Florence, Mass., for Henry L. Hanson Co., Worcester, Mass.

The problem of the Hanson Co. was to design a convenient package, small and light enough to be slipped into the pocket, yet tough enough to withstand daily abuse in the shop. After experimenting with various rigid molded plastics, the Hanson Co., with the cooperation of Prolon Plastics, hit upon the all-polyethylene case.

In designing the case, the fact that it is difficult to cement chemically inert, non-porous rigid polyethylene to itself using conventional adhesives in the conventional manner presented the major difficulty.

This roadblock was overcome by molding the front of the case, the back of the case, and an integral hinge connecting the two as a single unit — a production method which, incidentally, cut the cost of the finished case below that of the conventional metal unit.

The hinge is actually a flat strip of polyethylene which is a continuation of the two halves of the case; the clasp which locks the case together consists of a molded-in lug in the front half of the case which snaps into an undercut in the back half; the locks for the individual drills consist of two upright flexible fingers that can be forced apart to receive the drills and then snap back into position to hold the drills in place. Because the wall thickness of a polyethylene part determines the degree of flexibility, the hinge of the

(*To page* 214)



Fig. 1—Optimum utilization of proper plastics materials in construction of stereo camera makes possible extremely functional design and reduction of labor and time in assembly operations

Photos courtesy Eastman Kodak Co.

Simpler Stereo

Designed to make most effective use of plastics, new camera and viewer are super-functional examples of well-engineered applications

HOW can we use plastics most effectively in this product?

That is the first question Eastman Kodak design engineers ask themselves when starting creative work on a new camera, a viewer, or any other item. Kodak's record of increasing and successful use of plastics goes back more than 20 years (see MODERN PLASTICS, January 1950, p. 128) and reached the point of design primarily for plastics last year in a photocopier (see MODERN PLASTICS, July 1953, p. 80).

Reasons for this attitude towards design for maximum use of proper plastics are: a) a "complicated" large single plastics molding may obviate many small parts made from other materials; b) assembly labor and time may be reduced; c) simplicity of operation may be achieved; d) costs may be kept in line; e) function can be improved by proper material choice.

Kodak's new Stereo Camera (Fig. 1, also shown with its viewer in Fig.

SIMPLE TO TAKE

SIMPLE TO VIEW



Fig. 2—Stereo camera is simple to operate, thanks to efficient use of plastics; its companion piece, the stereo viewer, is also designed to take fullest advantage of plastics' versatility

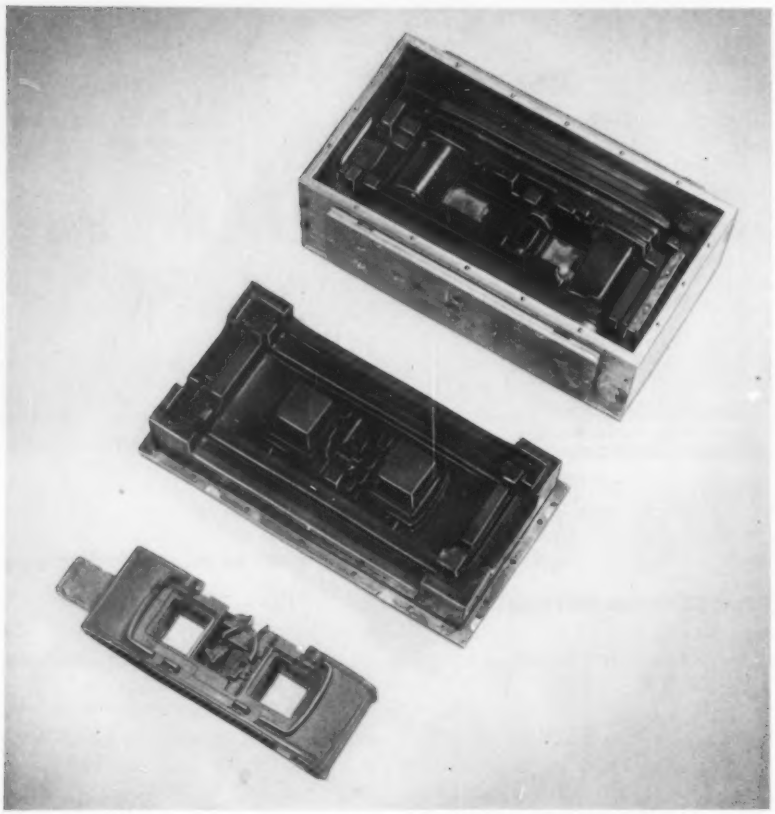


Fig. 3—To make first "rough" sample of the stereo camera body, model is first hand-tooled of aluminum (left corner); phenolic is cast in elastomeric mold made from model

2) is the latest example of the good results of this policy toward plastics use. The camera features extreme simplicity of operation and matched 35-mm. focal length Kodak Anaston Lenses, f/3.5. Both lenses are completely color corrected, coupled for dual focusing, and "lumenized" with Kodak's extra hard surface coating to reduce internal reflections and increase light transmission—both important factors in Kodachrome color photography.

Camera Features

Equipped with a new type Kodak shutter, with coupled blade action and having four speeds (1/25 to 1/200 sec.) plus provision for bulb exposures, the new camera has built-in flash synchronization, automatic shutter cocking as film is advanced, double exposure prevention, and an integral exposure calculator which, after the photographer selects his shutter speed, automatically indicates the proper lens opening with Kodachrome film for bright, hazy, or cloudy-bright lighting.

In addition to the standard footage scale, this stereo camera has a distance indicator which provides focusing points for groups, scenes, and close-ups. The viewfinder is con-

Complicated Molding Simplifies



Fig. 4—Intricacy of design detail is evident in these six views of stereo camera body (front, back, top, bottom, left, and right). One of the major advantages arising from such use of plastics is the possibility of achieving simple assembly through complexity in mold design

structed so that the photographer can see exactly what he will get on the stereo slide at all distances. A spirit level built in the camera viewfinder indicates when the camera is level—important in stereo work.

With a "no film threading" feature, the photographer simply inserts the film magazine in the camera, drops one end of the film over the take-up drum, and closes the camera. As the winding knob is turned, the take-up drum automatically engages the film and advances it.

Rapid, easy rewinding is provided by a folding crank built into the rewind knob. When this crank is pulled out, rewinding is fast, convenient, and simple. Other features are an automatic exposure counter, a film type indicator, and a depth-of-field scale.

To produce such a super-functional camera to retail at $84.50, complete with neck strap and lens cap, the design engineers centered their plans on two major phenolic components—a basic case, or body, and a front housing.

Creation of Model

The first step in the development of a new Kodak camera is, of course, the creation of a design and the making of a model. With such an intricate device, involving a variety of section thicknesses and complicated contours, a plaster model is out of the question. The model for this new stereo camera was hand-tooled from aluminum (Fig. 3). To translate from metal to plastic, the engineers used the relatively new technique of casting phenolic in a flexible elastomer mold (see MODERN PLASTICS, July 1954, p. 93). This "rough" casting of the proposed phenolic camera body was then studied from the standpoint of design, function, and mold design problems, was further refined for the fitting of other components, and another final model made.

Both the body and front housing are molded in brown phenolic; the body, being heavier, is molded of a longer-flow material than the front housing.

Molding Data

The molder, Waterbury Companies, Inc., Waterbury, Conn., uses a 170-ton Dunning & Boschert transfer press with automatic cycle control for the case itself. The mold used is a two-cavity transfer type; preheating is done on a Thermall electronic unit.

For the camera body molding, hydraulic pressure is set at 150 tons, die temperature at 340° F. A preform weighing 410 g. preheated to 240° F. transfers in 15 sec. to give a complete molding cycle of 2¼ minutes. While press curing is going on, shrink blocks are placed in the latest molded parts and kept there for 20 min., after which gates are removed and the moldings inspected and packed.

A plunger-type 300-ton press with a four-cavity mold is used for the Stereo Camera front housing, preheating being also electronic. A 1-min. cycle is achieved by the use of 300-ton clamping pressure and 20-ton plunger pressure, the die temperature being 240° F. and preheated material entering at 230° F. Parts are placed on shrink blocks for two minutes.

These two parts required a most complicated mold design job; production requires a delicate, balanced molding operation.

The six photographs shown in Fig. 4, presenting every side of the phenolic camera body, will illustrate this

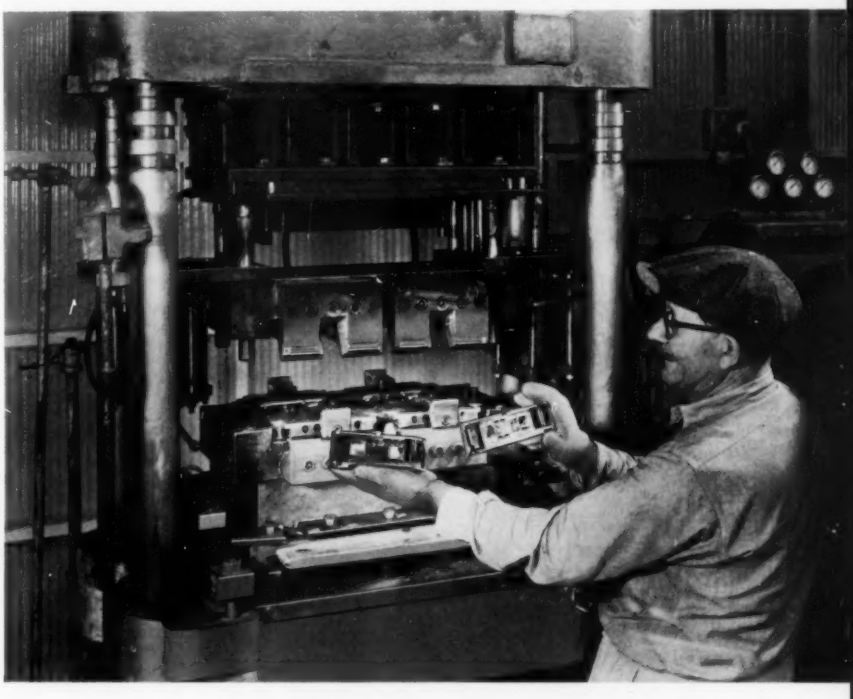


Fig. 5—Camera bodies, transfer molded in two-cavity mold on 170-ton press, are removed at end of cycle. Cycle, including preheat and transfer period, is 2¼ minutes

Assembly





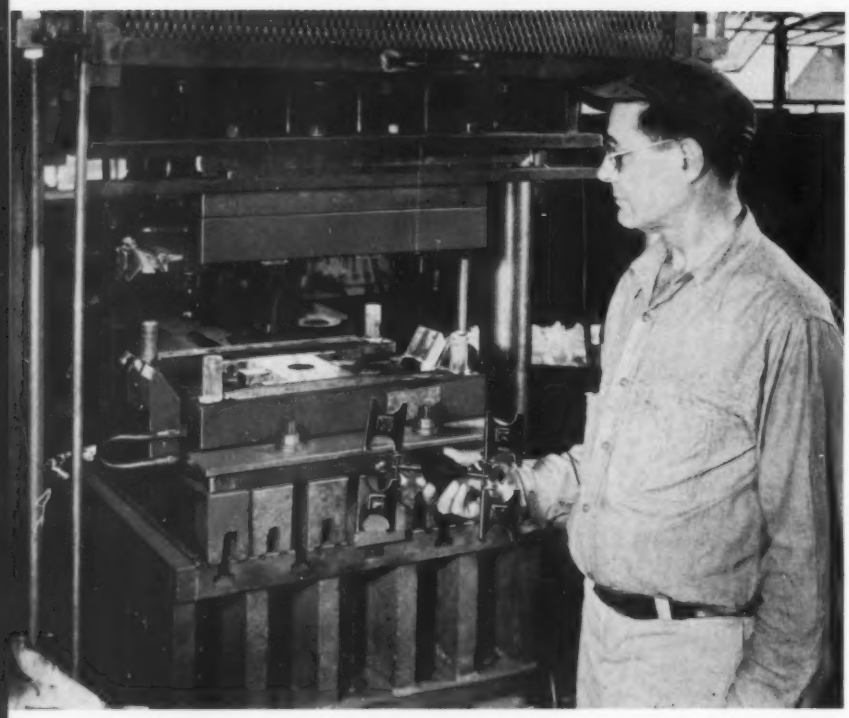


Fig. 6—Camera front housing is molded in a four-cavity mold on a 300-ton plunger-type press. Proper control of temperature and pressure results in 1-min. cycles

point. Figure 5 shows two camera bodies being removed from the press, while Fig. 6 shows four plunger molded front housings on their sprue.

A total of 15 plastics components, including body and front housing, comprise the new Stereo Camera (Figure 7). They include an acrylic lens for the viewfinder designed, tooled, and molded at Camera Works; a film sprocket bearing cap in which is molded the name of the camera and other data; a nylon cam dyed black; a phenolic eye lens cover; a Tenite butyrate cover which protects the taking lenses; two small nylon thrust washers on winding assemblies; die-cut textured Kodadur cellulose nitrate-coated cloth, which is cemented to the front of the phenolic body and to the camera back; and a Zytel-covered, cotton-filled webbed strap for supporting the camera.

Figure 8 shows the operation of the cementing jig, especially designed for putting the textured covering on the body. Figure 9 shows front assemblies temporarily

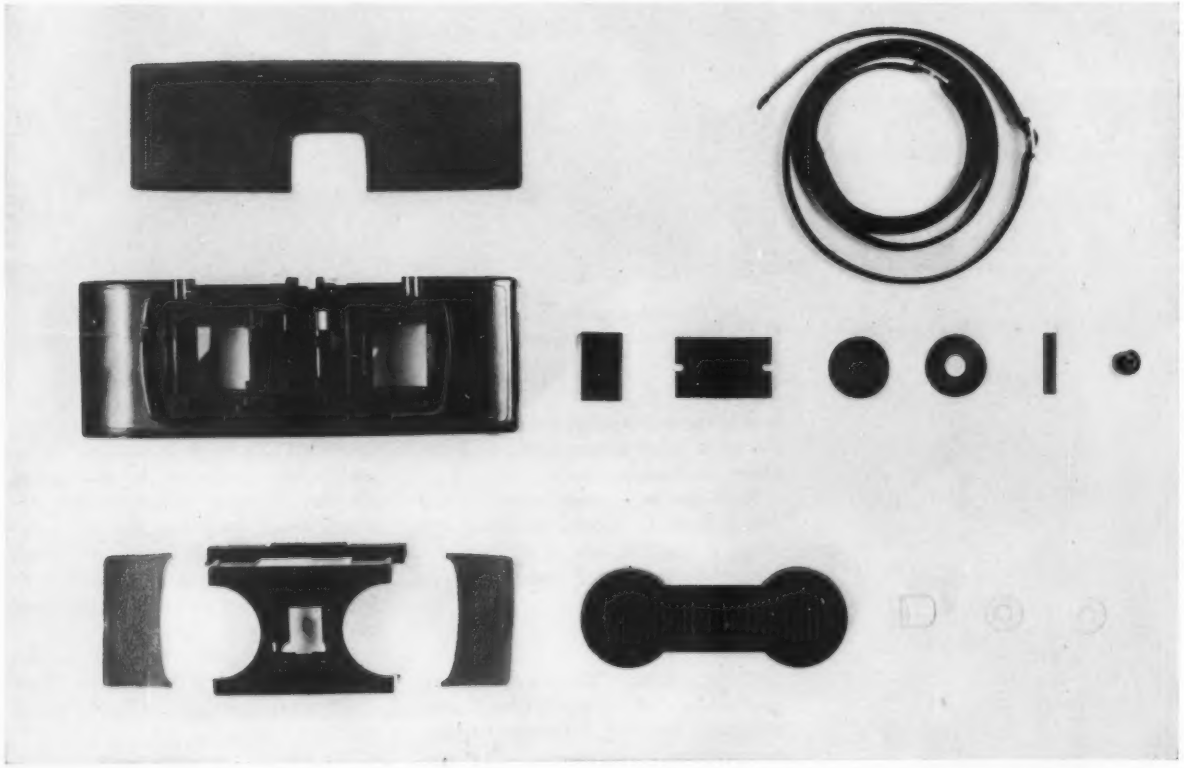


Fig. 7—A total of 15 plastics components go into construction of stereo camera. These include, in addition to body and front housing, an acrylic lens for the viewfinder, a film sprocket bearing cap, textured cellulose nitrate-coated cloth, and nylon and butyrate parts

packed in polyethylene bags to protect them from dust and shield them against damage.

Stereo Viewer

Accompanying the new Kodak Stereo Camera is a new stereo viewer (Fig. 10) of advanced design, produced in two models. The inexpensive Model I is supplied as a battery model (Fig. 11), but can be converted to a line-powered model (Fig. 12) by use of a simple conversion kit. Model II is supplied as a line-powered model and can be converted to a battery model at will. Acrylic lenses are used on the Model I only. These lenses were designed, tooled, and molded at Camera Works.

As line-powered models, the new stereo viewers are equipped with an integral brightness control rheostat and both models use a positive focus control, wherein the slide holder, rather than the eye piece, is the movable part that brings the picture into proper focus and maximum sharpness.

CREDITS: Molder of Stereo Camera body, front housing, and other phenolic parts, Waterbury Companies, Inc., Waterbury, Conn. Mold engineering by Waterbury Companies, Inc. Mold construction by Model Tool Co., Bridgeport, Conn. Phenolic mold material: Durez #11540 Brown. Molder of camera lens cover (Tenite butyrate), Quinn-Berry Corp., Erie, Pa. Molder of viewer housings, Kurz-Kasch, Inc., Dayton, Ohio. Mold construction by Akromold, Akron, Ohio. Material: Durez #740 Brown. Molder of miscellaneous internal camera and viewer phenolic, butyrate, and nylon parts: Waterbury Companies, Inc.



Fig. 8—Cementing jig for applying cellulose nitrate-coated cloth covering to the camera body. Textured design of the covering gives high price look to low cost camera



Fig. 9—Partial view of stereo camera assembly line. Camera front assemblies are temporarily packed in polyethylene bags to protect them from dust and other damage



Fig. 10—Phenolic stereo viewer combines streamlined beauty with functional design



Fig. 11—Model I stereo viewer is battery operated and comes with acrylic lenses

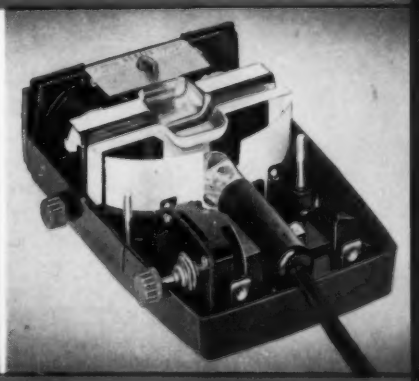
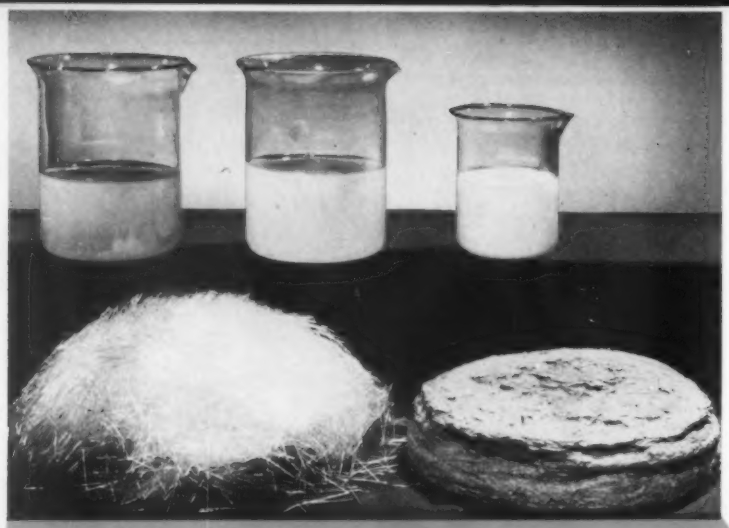


Fig. 12—Model II viewer is line powered, has integral brightness control rheostat



Basic raw materials (left) that go into the production of a complete line of streamlined, practical reinforced plastics luggage (below) include: (top row) melamine resin, colloidal binder mixed with polyester resin, vinyl resin, and (bottom row) fibrous glass and cellulose fibers

PRODUCTION-LINE LUGGAGE

Adapting slurry preforming to the production of a complete line of reinforced plastics luggage cuts costs and improves physical properties



SATISFACTION in luggage results from three things: light weight, eye appeal, and strength. From the standpoint of cost to the consumer, adaptability of design and materials to modern high-speed production techniques can also be added to these considerations.

Reinforced plastics luggage embodying most of these desirable features has been produced on a limited scale in the past. Consumer acceptance of the initial offerings has been excellent and enthusiasm for the application ran high.

Now, with the introduction by American Tourister, West Warwick, R. I., of a complete line of reinforced plastics luggage for men and women, the position of the material in the field has been considerably strengthened. Backed by an aggressive promotion and merchandising campaign, the highly styled, functional pieces are expected to win many new converts for tough, lightweight, and attractive reinforced plastics luggage.

The new line, tradenamed Tri-Taper, is the result of cooperative effort between American Tourister, Jon W. Hauser and Assoc., industrial designers, and Hawley Products Co., St. Charles, Ill., pioneers in the development of slurry preforming.[1] The several pieces of luggage in the line are, as a matter of fact, among the first consumer applications to take advantage of slurry preforming ("Aqua-glas" molding), the process by which preforms for reinforced plastics parts are made by wet processing tech-

1. "The Why and How of Slurry Preforming," MODERN PLASTICS *31*, 99 (Nov. 1953).

niques similar to those used in the pulp molding industry.

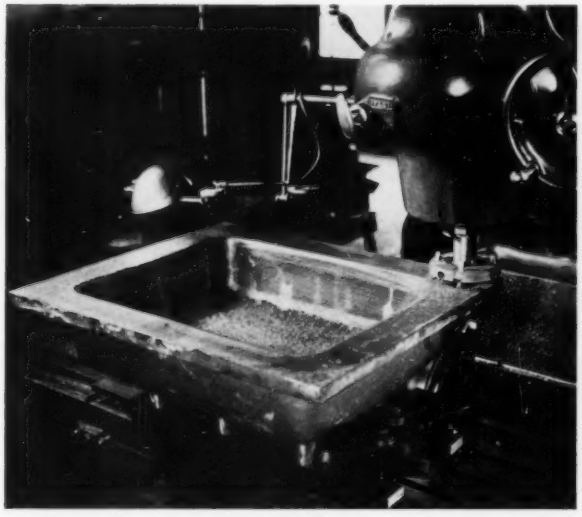
Before the first piece of luggage was ever put on the market, more than $250,000 had been spent on dies and tools. So much special equipment was needed, in fact, that both American Tourister and Hawley Products had to enlarge their facilities to assure a closely integrated, uninterrupted flow of production to meet the anticipated demand for the luggage, which was expected to be high.

The basic raw materials in the production of the Tri-Taper luggage are fibrous glass, cellulose fiber filler, vinyl resin, synthetic latex emulsion, polyester resin, and melamine resin.

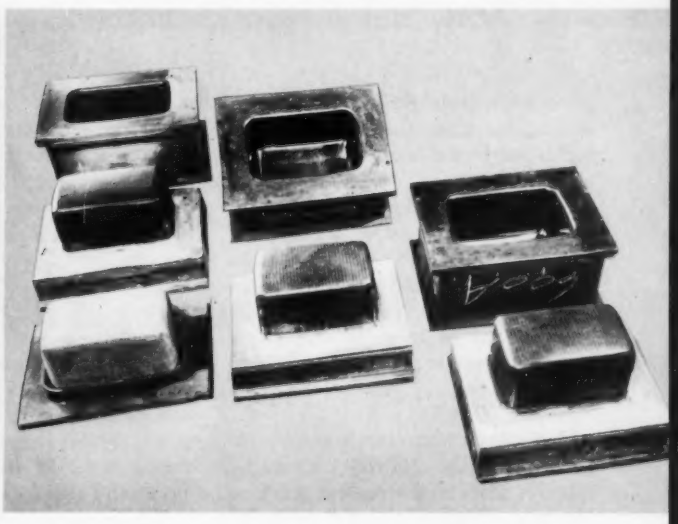
Strength, Light Weight

Each of these materials makes an important contribution to one or more of the physical characteristics of the finished piece. The fibrous glass, for example, contributes high impact strength and rigidity; the cellulose fibers act as a low density filler that contributes much to the light weight and smooth surface finish of the luggage; and the various resins and binders combine the structure into a uniform mass, adding, at the same time, to stiffness, strength, and stability.

Tri-Taper is manufactured in ten sizes and twelve styles and a complete set of matched molding dies had to be made for each size—a grand total of 81 dies. Because a vinyl covering is later molded on directly over the reinforced plastic part, it was necessary to maintain extremely close tolerances in the construction of these dies to assure that the molded piece would fit into the covering die. This was accom-



Mold for two-suiter suitcase is faced off in vertical milling machine prior to being cut to exact contours on a Keller duplicating machine



Sets of matched metal dies for train case box—part of a total of 81 dies that were used for the line—ready to be mounted in presses

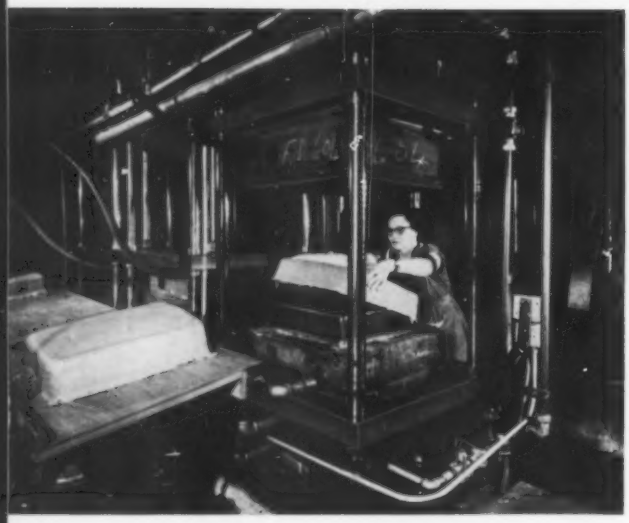
All photos courtesy American Tourister



Slurry process method for making luggage shell preforms begins with adding fibrous glass to the resins and cellulose fibers in a mixing vat



From the vat, mixture is pumped into a tank and then formed on a die into the shape of the finished piece of luggage



Preform, while still wet, is placed between set of compression molds heated to 500° F. Cured piece, before trimming, is on the table at left

plished with a Keller duplicating milling machine that cut each die according to the contours of a master model.

Before the molding process could start, numerous other mechanical parts, such as heat chests, vacuum manifolds, and collector rings, also had to be built. The tooling took the full use of two die shops and required over a year's time.

Molding

The shells for the luggage are preformed by Hawley Products. Fibrous glass and cellulose are first put into a huge vat and the combination of materials is agitated. At the proper moment, the resins are added to the mixture, where they coat each individual glass and cellulose fiber. The final mixture, after further processing, is then pumped into a tank and a preform is made on a die in the shape of the finished article.

While still wet, the preform is removed from the preform die and placed between a set of compression molds heated to 500° F. The molds are then closed and pressure is applied. Following the molding, the cured shell is removed from the press and closely trimmed to size.

The unusual contour of the Tri-Taper suitcase—styled to facilitate stacking and handling and to provide the modern appearance of the line—makes it necessary to actually mold the covering to the reinforced plastic shell.

The Permanite covering, a cast vinyl film laminated to cloth, is first coated on the reverse side with a vinyl resin adhesive which acts as the bonding agent. The shell is placed over a male die, the covering is laid on top of the shell, and the two parts are plunged into a heated female die. With the application of pressure, the vinyl-coated fabric becomes securely bonded to the reinforced plastic shell.

The finished piece is then transferred to the final assembly line, where, after the top and bottom of the case have been perfectly aligned, stainless steel closures are hand-fitted to the shells. These metal strips assure that the case, when closed, will have no openings to admit dust or moisture. They also add to the strength and rigidity of the finished case.

Precision multiple presses then prepare the shells for installation of handles, locks, hinges, and skids. As the final step in the manufacture of the luggage, the interior of each case is carefully lined with cloth.

According to the management of American Tourister, Tri-Taper luggage for ladies and men has already met with enthusiastic acceptance in department stores and luggage specialty shops throughout the country.



Vinyl-coated fabric, with a vinyl resin adhesive applied to one side, is inserted into the covering die on top of the cured luggage shell



After fabric has been bonded to the shell, the finished piece is removed from the press and transferred to final assembly line

Dispensed with Dispatch

Two streamlined molded styrene dispensers open new markets for plastics in "easy-to-use" packages for surgical tape





To dispense tape from new styrene container (left), tape is pulled out through slot and cut cleanly off by a sliding metal cutter. Mating rims molded into top and bottom of container (above) facilitate stacking of units

Photos courtesy Johnson & Johnson

BY TAKING advantage of the product design potential inherent in plastics materials, the two leading manufacturers of surgical adhesive tape in the United States—each working independently of the other—have simultaneously come up with molded styrene containers that allow the tape to be dispensed more easily and neatly than has heretofore been possible.

The two dispensers, although differing in shape and size, both incorporate integral cutting devices—one uses a set of molded-in styrene teeth, the other uses a sliding metal cutter—that effortlessly snip the tape cleanly off at just the right length. Unlike the conventional metal spool-and-shell container which the two new models are designed to supplement, there is no need to take the dispenser apart to get at the tape nor is it necessary to use a pair of scissors to cut the sticky material.

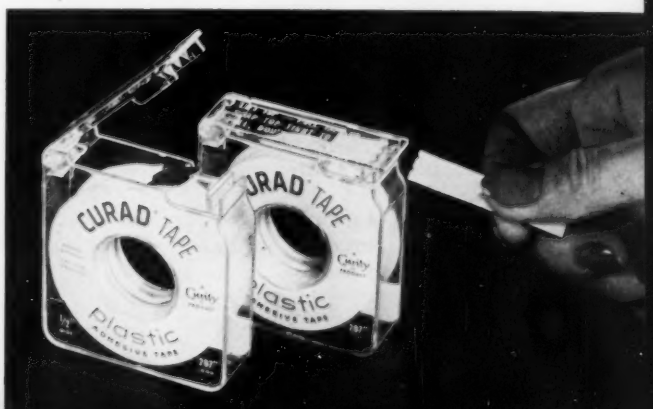
One of the dispensers is a product of Bauer & Black, Div. of The Kendall Co., Chicago, Ill.; the other dispenser is being marketed by Johnson & Johnson, New Brunswick, N. J.

The Bauer & Black model is a square-shaped, 2½ in. high container molded of clear transparent styrene that enables the user to see exactly how much tape is left on the roll. When the dispenser is to be used, a hinged lid at the top of the square case is lifted up and the tape, which is wound around a molded-in core in the center of the unit, is pulled out to the desired length. To cut the tape, the lid is simply snapped shut again. Three sharp triangular teeth molded into the front edge of the lid cut the tape off evenly, without any raveled ends or mashed together edges.

The dispenser is molded in three parts: the case front which includes one half of the molded-in core; the back of the case which incorporates the other half of the core; and the hinged lid. All parts are pin-point gated and are held to extremely close tolerances during molding.

The three parts are so designed that they can be easily snap-fitted together on the assembly line after the roll of tape has been dropped on over one of the core halves. This is accomplished by molding a series of projections along the edges of one of the case halves and one of the core halves. Matching undercuts which receive the projections during assembly are molded into the other case half and core half. In order

(*To page* 218)



Courtesy Bauer & Black

Sharp teeth molded into the lid of another new styrene dispenser function as integral cutting device. Lid is simply snapped shut on top of tape to snip it off at the desired length

DESIGNED for CASEMENT WINDOWS

Permanent wood-grain pattern is feature of one of several large molded styrene parts used in new Servel room air conditioner



Interior cabinet of compact home air conditioning unit for installation in casement window is made of high-impact styrene parts with an integral furniture-type finish

MEETING a specialized design problem for such products as home appliances without compromising either the appearance or functional efficiency sometimes proves to be a difficult assignment. In developing the first room air conditioner specifically designed for casement window installation, Servel, Inc., had a number of such problems to solve. How successfully they have been met through use of molded plastic parts is shown by the accompanying photos.

This addition to Servel's 1954 line of room air conditioners, available in both ⅓-ton and ½-ton capacities, is only about half as wide as a conventionally styled room cooler. Unusual in its compactness and revolutionary design treatment, it overcomes handicaps which have always plagued installations in homes, apartments, and offices having casement type windows. These Servel air conditioners (also sold under the Wonderair name for distribution through Servel air conditioning distributors and dealers) will fit different types and brands of casement windows, as well as standard windows and many special types. With this model, no expensive window alteration is involved; the glass pane is simply removed and the unit slipped through the opening for a neat, convenient installation.

All parts of the air conditioner which extend into the room are injection molded of high-impact styrene, providing a combination of integral color, molded-in design de-

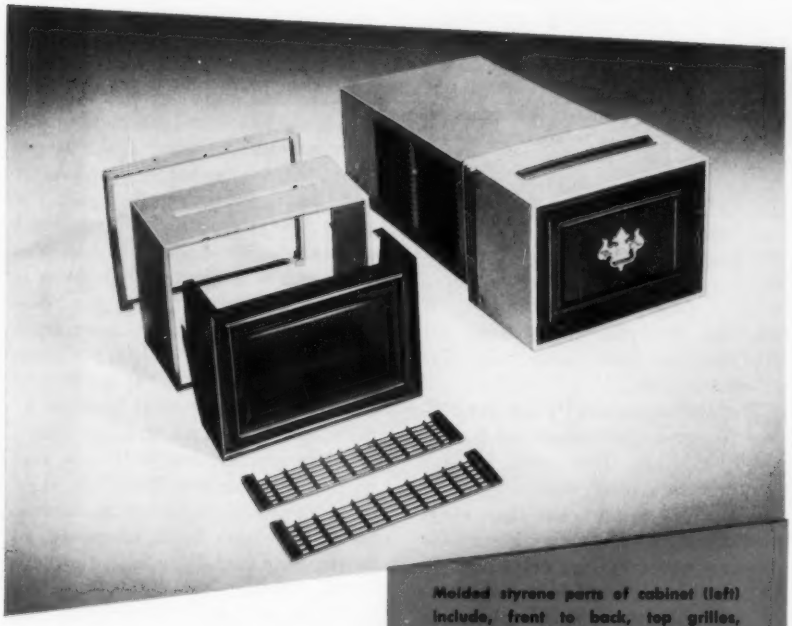
tails, avoidance of rust, and effective insulation against both heat and operating noise. The room cabinet itself, produced in a blonde color except for the mottled mahogany front, measures only 11½ in. high, 14¼ in. wide and 9⅛ in. deep. The depth of the exterior weather cabinet, fabricated of bonderized steel with baked enamel finish, is 23 inches.

The new Servel casement window type model marks a complete departure in appearance from most room air conditioners now on the market. The decorator-designed cabinet has the appearance of a piece of fine furniture, with a drawer-like front and furniture-type "pull." The position of the drawer regulates the complete operation of the appliance. This arrangement eliminates the need for any type of visible controls, since the horizontal movement of the drawer actuates concealed Microswitch controls within the cabinet.

When the front is pushed back to the closed position, the unit is shut off entirely. With the drawer pulled out to the first setting, as when outside weather is pleasant, the appliance provides ventilation only; at the middle position, both ventilation and cooling are supplied; when maximum cooling effect is desired, the front is drawn out to its most extended position. As soon as the drawer is closed again, the unit shuts off without recourse to dials, levers, or pushbuttons.

The no-draft type grilles through which air is directed into the room are located at the upper and lower edges of the sliding front section. They are scientifically designed to direct air outward at a 35° angle, eliminating annoying drafts. Adding further convenience to the casement window model is the incorporation

(*To page* 227)

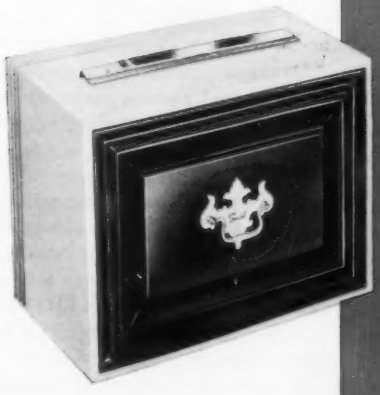


Molded styrene parts of cabinet (left) include, front to back, top grilles, drawer front, cabinet section, and back louvers; complete unit is at right.

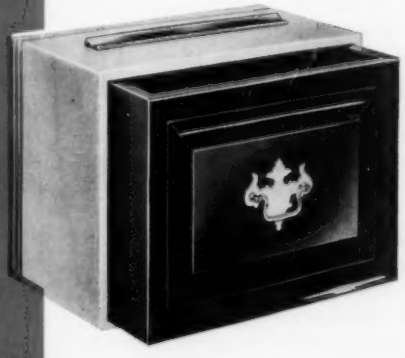


Photos courtesy Servel, Inc.

Permanent filter of air conditioner is easily removed through molded-in slot at top of interior cabinet, can be cleaned with soap and water for reuse



Air conditioner has no visible controls, is regulated by opening or closing drawer-like front. In closed position (left), unit is shut off; fully extended (right), it provides maximum cooling. Two intermediate positions (not shown) furnish ventilation only and ventilation plus limited cooling



PLASTICIZERS FOR THE VINYL MARKET

Plasticizers are largely dependent upon the plastics industry. A large portion of what isn't used for vinyl chloride goes mostly into other vinyls and cellulosics. Yet there are important other uses for plasticizers, particularly for military purposes, that help to create uncertain and unpredictable markets. This analysis of plasticizer production in 1953 is an effort to separate the amount of plasticizer business dependent upon vinyl chloride from all other miscellaneous classifications in order to show the dependency of one upon the other.

PLASTICIZER production in 1953 is listed at 293 million lb., compared to 267 million lb. in 1952, by the U. S. Tariff Commission in its preliminary annual report. But variations have been made in the method of reporting. The reader will see that the footnote at the bottom of Table I indicates that part of the lauric, oleic, and stearic acid materials are no longer listed as plasticizers. It should also be noted that polyester plasticizers are included in the 1953 figures for the first time, as indicated in footnote 6, Table I.

The Government's figures are separated into cyclic and acyclic classifications. The cyclics contain an aromatic or benzene nucleus in some part of their chemical structure. In the main, they are derived wholly or partially from coal tar or its equivalent. Acyclic products do not contain any aromatic grouping and generally consist of aliphatic chemicals which may be derived from natural gas, vegetable oils, fats, or fermentation products.

Biggest Volume for Vinyl

Since the theme of this article is to point out the quantity of plasticizers used with vinyl chloride and copolymer resins, it is necessary to separate the plasticizers used for that purpose and those used for other purposes.

The phthalates are by far the biggest volume plasticizers used with vinyl chloride. But even in this group there is a substantial quantity used for other purposes than vinyl plasticization. The big items for vinyls are the various octyl phthalates, best known and oldest of which is di (2-ethylhexyl) phthalate known as D.O.P. This type is produced from phthalic anhydride and octyl alcohol. During the last two or three years, a similar material, called D.I.O.P., using iso-octyl-alcohol derived from petroleum, has become available in good volume.

Both D.O.P. and D.I.O.P. are widely used as general-purpose plasticizers and accounted for 85 million lb., or around 40%, of all the plasticizers used in vinyl chlorides in 1953. D.O.P. production grew from around 20 million lb. in 1946 to 65 million lb. in 1951 and has declined somewhat since then.

D.O.P. usage may have been affected by the availability of other alcohols which make more variations in octyl phthalate plasticizers possible and in the increasing growth of D.I.O.P. which has absorbed some of D.O.P.'s potential market. D.I.O.P. has grown from 1½ million lb. in 1949 to around 25 million lb. in 1953.

Di-n-octyl phthalates (D.N.O.P.) are believed to have almost disappeared from the market, although several million lb. were listed in the Tariff reports of a few years ago. The "mixtures" reported along with D.N.O.P. and D.I.O.P. are in considerable but unknown volume; that is, there is no way of knowing how much of each particular octyl phthalate is included.

Headway Being Made

Octyl decyl phthalate has been making considerable headway over the past few years. Before 1953 it was always reported in a miscellaneous category, so past figures are unavailable. There are two types of decyl alcohol—one produced from cocoanut oil, the other from petroleum, but the former is best known and most widely used. Until recently, decyl alcohol from cocoanut oil was scarce and supply of the plasticizer was limited, but there is now enough to supply present demand. Octyl decyl plasticizers from cocoanut oil command a premium price of 1 or 2¢ a lb., but are nearly always in good demand because of their excellent light stability, electrical properties, low volatility, and particularly for the flexibility they impart to vinyls at low temperature. They have also been suggested as particularly useful for imparting low initial viscosity and "slow viscosity build-up on aging" to plastisols and organosols.

The petroleum decyl and octyl phthalates are finding increased usage because of unlimited availability and properties such as volatility, soapy water extraction, and plastisol viscosity that are claimed to be better than D.O.P. and D.I.O.P. They sell at the same price as the latter two.

Dicapryl phthalate plasticizers first apeared as a separate item in the Tariff reports in 1952. Production then was 5.2 million lb. which grew to 7.8 million in 1953. Capryl alcohol is a by-product of sebacic acid production and the latter stems from castor oil. The phthalate plasticizer employing capryl alcohol costs several cents a lb. less than D.O.P. and is generally used for blending with other plasticizers to cut costs.

A hazarded guess as to what may

Table I—United States Production and Sales of Plasticizers*

Chemical	Production 1952[1]	Production 1953	Sales		Unit Value[2]
			Quantity	Value	
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 dollars	Per pound
GRAND TOTAL	266,957	292,898	235,066	83,335	$0.35
PLASTICIZERS, CYCLIC					
Total	194,362	223,810	180,137	59,955	0.33
Phosphoric acid esters:					
Tricresyl phosphate[3]	18,031	22,109	21,043	6,866	0.33
Triphenyl phosphate	5,758	7,418	3,289	1,206	0.37
Phthalic anhydride esters, total	149,826	165,237	132,912	44,523	0.33
Dibutyl phthalate	17,881	23,280	18,256	5,372	0.29
Dicapryl phthalate	5,246	7,762	9,398	3,091	0.33
Diethyl phthalate	12,138	17,584	12,307	3,096	0.25
Di(2-methoxyethyl)phthalate (Di(methyl cellosolve) phthalate)	1,576	2,240	—	—	—
Dimethyl phthalate	2,901	2,508	2,734	696	0.25
Dioctyl phthalates, total	86,857	84,813	66,423	23,193	0.35
Di(2-ethylhexyl)phthalate	63,236	51,281	38,640	13,704	0.35
Di-n-octyl phthalate, diiso-octyl phthalate, and mixtures	23,621	33,532	27,783	9,489	0.34
Octyl decyl phthalate	—	8,678	8,130	2,938	0.36
All other	20,747	18,372	15,664	6,137	0.39
All other cyclic plasticizers[4]	20,747	29,046	22,893	7,360	0.32
PLASTICIZERS, ACYCLIC					
Total	72,595	69,088	54,929	23,380	0.43
Adipic acid esters, total	7,277	9,177	6,060	2,722	0.45
Di(2-ethylhexyl adipate)	3,204	3,497	2,045	896	0.44
Diiso-octyl adipate	1,125	1,511	1,276	589	0.46
All other	2,948	4,169	2,739	1,237	0.45
Lauric acid esters	1,050	113	106	42	0.40
Oleic acid esters, total	6,645	7,952	5,628	1,756	0.31
Butyl oleate	—	1,372	—	—	—
Glyceryl trioleate[5]	—	3,214	3,323	838	0.25
All other	—	3,366	2,305	918	0.41
Phosphoric acid esters	8,991	8,534	6,398	2,898	0.45
Ricinoleic and acetylricinoleic acid esters	4,295	4,572	—	—	—
Sebacic acid esters, total	5,653	5,701	4,419	3,545	0.80
Dibutyl sebacate	2,215	2,186	—	—	—
Di(2-ethylhexyl)sebacate	3,004	2,498	2,432	1,736	0.71
All other	1,434	1,017	1,987	1,809	0.91
Stearic acid esters, total	16,245	4,539	4,150	1,089	0.26
Butyl stearate	—	2,417	2,121	471	0.22
All other	—	2,122	2,029	618	0.30
All other acyclic plasticizers[6]	22,519	28,500	28,168	11,328	0.40

* U.S. Tariff Commission.

[1] The column on 1952 production is from the Tariff Commission report as printed on p. 117 of the October 1953 issue of MODERN PLASTICS. The blanks in this column indicate that there was no separate figure for that material in 1952 or that there has been a change in listing procedure. Following footnotes apply only to 1953 figures.

[2] Calculated on rounded figures.

[3] Includes data for material reported for use as motor-fuel additive.

[4] Includes data for phosphoric acid esters, synthetic camphor, toluene-sulfonamides, tetrahydrofurfuryl oleate, and other cyclic plasticizers.

[5] Includes data for material reported for use as surface-active agent.

[6] Includes data for palmitic, citric and acetylcitric, azelaic, pelargonic, and tartaric acid esters, and for butyl myristate, glyceryl and glycol esters of certain fatty acids, glyceryl tripropionate, and complex polymeric plasticizers. NOTE—Because of changes in major use in recent years, data for certain esters of lauric, oleic, and stearic acid which were classified as plasticizers in 1952 are classified as surface-active agents in 1953 and data on their production and sales will be included in a section of the Tariff Commission's report covering surface-active agents.

Production of all plasticizers in 1953 would have been 17 million pounds larger—5.8 percent of the total output—if the data had included production of the same lauric, stearic, and oleic acid esters as were included in 1952.

be in the "all other phthalate" classification would include such materials as butyl benzyl phthalate, phthalyl glycolates, dibutyl cellusolve phtalate, diphenyl phthalate, diallyl phthalate, and butyl decyl phthalate.

Most of these plasticizers are used in vinyl chloride compounds. Somewhere around 10 million lb. of these "all other phthalate plasticizers" are used for vinyl chloride. Each is used to perform a specific function.

Other Than Vinyl Use

The other phthalates listed under "phthalic anhydride esters" are used for purposes other than vinyl chloride plasticization. Their principal uses are in cellulose acetate, nitrocellulose lacquers, gunpowder, and insect repellents.

After deducting the phthalates used with other than vinyl chloride from the total phthalate production of 165.2 million lb., the amount used for vinyl chloride in 1953 was 110 million lb. in contrast to 105 million lb. in 1952.

After phthalates, the next biggest volume use plasticizer for vinyl chloride is the phosphate type. The total amount of phosphate plasticizers is impossible to dig out of the Tariff report because they are listed in various classifications under both cyclic and acyclic plasticizers. The best known is tricresyl phosphate which increased from 18 million lb. in 1952 to 22.1 million in 1953. But its volume use with vinyl chloride remained about the same—somewhere between 13 and 15 million pounds.

Tricresyl is used to impart flame resistance not only to vinyls, but in some cases to phenolic and polyester laminates where it also helps flexibility and lessens cracking around metal inserts. The greatest part of tricresyl production not used for vinyl finds outlets in such fields as hydraulic fluids, nitrocellulose lacquers, filter adhesive coatings, and as additives to gasoline. It is estimated that over 2 million lb. were used for the latter purpose in 1953—and this may grow to five or six million in another year or two.

Triphenyl phosphate is used almost entirely in acetate safety film for movies.

Table II—The More Important Members of the Plasticizer Families for Vinyls

Types of Plasticizers	*Estimated Consumption 1952 in Pounds in 1000 lb.*	*Estimated Consumption 1953 in Pounds in 1000 lb.*	*Prominent Members of Family Groups*
Phthalates	105,000	110,000	di-2-ethylhexyl phthalate (DOP) di-iso-octyl phthalate (DIOP) dicapryl phthalate (DCP) n-octyl, n-decyl phthalates butyl decyl phthalate didecyl phthalate butyl benzyl phthalate butyl cyclohexyl phthalate di-2-ethylhexyl hexahydrophthalate mixed 8 carbon alcohol phthalate
Phosphates	25,000	25,000	tricresyl phosphate; ethylhexyl diphenyl phosphate; cresyl diphenyl phosphate.
Low-temperature plasticizers	25,000	25,000	dioctyl sebacate; various dioctyl adipates; dioctyl azelate; recinoleates; glycol esters of ethylhexoic acid; pelargonic acid, and vegetable oil fatty acids; tri-2-ethylhexyl phosphate; epoxidized fatty acid esters, tributoxyethyl phosphate.
Resinous plasticizers	17,000	20,000	See text.
Miscellaneous or special purpose plasticizers	5,000	5,000	diethylene glycol dibenzoate; tributyl acetyl citrate; methyl pentachlorstearate; nitrile rubber.
Plasticizer extenders	8,000	10,000	chlorinated paraffins; alpha methylstyrene resins; hydrogenated triphenyls; petroleum by-products.
Total	183,000	195,000	

Most Important for Plastics

The classification "all other cyclic plasticizers" contains a host of products as pointed out in footnote 4, Table I, but by far the most important for plastics are the cyclic-type phosphoric acid esters as distinguished from the phosphoric acid esters listed in the acyclic plasticizers. Furthermore, probably 45% of these "all other cyclic plasticizers" are phosphate plasticizers, all used for vinyl. The chief phosphate plasticizers mentioned here are diphenyl cresyl phosphate and alkyl aryl phosphate. One is suggested especially for its non-toxic properties and both for flame resistance. They are also found useful as all-purpose plasticizers.

In the acyclic plasticizer classification, the amount used for vinyl is even more difficult to separate than in the cyclic plasticizers. The first and largest are the adipates. They are generally higher priced than general-purpose plasticizers and are used in comparatively small portions in the compound but contribute low-temperature flexibility and good "hand" or feel to the finished vinyl product. Di (2-ethylhexyl adipate), D.O.A., and di-iso-octyl adipate, D.I.O.A., are the two most generally used with vinyl chloride. The "all others" includes octyl decyl adipate which has some small use with vinyl chloride; butoxyethyl adipate which is used with polyvinyl butyral for safety glass; and di-iso-butyl adipate, used with another vinyl resin.

From Vegetable and Animal Fats

The lauric, oleic, and stearic acid types (all stemming from vegetable and animal fats) that are left in this table after the previously noted de-

(*To page* 220)

COLOR IN PLASTICS

Part 4 of a Symposium in Print

The first three parts of this series of articles appeared in the July, August, and September issues of MODERN PLASTICS Magazine. These three parts encompassed ten articles under the following titles: The Problems of Color in Plastics; Color Surveys: 5 Methods; Color Sells Plastics; Types of Colorants for Plastics; Acrylic Color Techniques; Color in Styrene and its Alloys; Coloring Polyethylene; Colorants for Vinyl; Color in the Resin-Rubber Plastics; and Cellulosics: Color Unlimited. The present articles deal with problems of color as related to polyesters and fluorocarbons. All of these articles were specially prepared for MODERN PLASTICS by experts in the various fields covered.



Coloring the Fluorocarbons

by James R. Jones

IN THE fluorocarbon resins, with their excellent chemical and physical properties, workability, and adaptability to product design and application, is found a very definite need for close cooperation between the basic color manufacturers and the resin manufacturers and suppliers. This has come about because of the need for increased stability and non-reactivity of colors.

In order to explore the coloring aspects of the fluorocarbons, a limited explanation of the two major polymers—trifluorochloroethylene and tetrafluoroethylene—is desirable.

Trifluorochloroethylene

These polymers are manufactured by The M. W. Kellogg Co. and Bakelite Co., a Div. of Union Carbide and Carbon Corp. The former firm supplies the resins under its registered trademark of Kel-F, while the latter firm has trademarked its products as Bakelite Fluorothene.

These polymers, in resin form, are colorless and, therefore, adaptability to a wide color range is excellent. Chemically speaking, the chlorine portion of this high-molecular-weight polymer contributes to the transparency, exceptionally good flow, and rigidity characteristics. The fluorine is responsible for the chemical inertness and zero moisture absorption. (1)[1]

Methods of fabrication of Kel-F and Fluorothene include injection, compression, or transfer molding, film and contour extrusions, and coating applications. It is necessary, however, to make equipment modifications to adjust for higher temperature requirements and general workability characteristics. The working temperature could be listed as being from 450 to 650° F. but favor must be given to the higher side of this temperature range. It can immediately be seen that the high softening temperature, resistance to burning, chemical inertness, weathering and moisture resistance, and excellent electrical and zero temperature properties present a wide range of uses for these materials.



James R. Jones, Jr. has been associated with the Ferro Corp. since he received his A.B. degree in chemistry from Wittenberg College in 1950. Mr. Jones' background includes work as a plastics color technician—one of his first positions at Ferro—and work in the Plastic Color Sales and Service Dept. He currently holds the position of Technical Representative of Ferro's International Div. Jim is also active in the direct sales of Ferro's color and fibrous glass products abroad, particularly in those areas not conveniently reached by Ferro subsidiaries.

Tetrafluoroethylene

This polymer is marketed by the Polychemicals Dept. of E. I. du Pont de Nemours & Co., Inc. under their registered tradename of Teflon. In its molded form this polymer is milky in color. Color adaptability is good, with a full range of translucent or opaque colors which can be molded in thin sections. A full range of opaque colors can be produced in thicker sections.

Conventional molding and extrusion techniques are not applicable to Teflon, because this resin does not melt or flow, nor does it have a solvent. It is necessary to mold Teflon by modified compression molding techniques which depend upon the fusion of solid particles that have been compressed into a mass of desired shape. Other techniques and resin forms have also been developed for extrusion and coating applications. (2)

Pigment Consideration

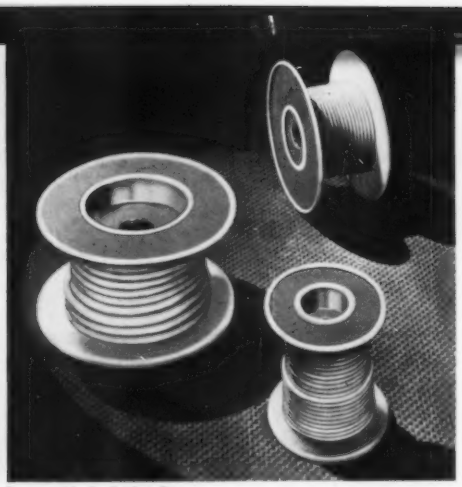
The consideration of proper pigments for use with these two basic fluorocarbons are very similar. One of the first and most basic requirements of the coloring agent is its ability to resist decomposition or, in effect, be stable at high molding or fabrication temperatures. This characteristic alone, however, does not make an individual pigment satis-

[1] References to numbers in parentheses are at end of article, P. 224.



Courtesy The M. W. Kellogg Co.

Plastic parts of antenna mount are molded of Ferro olive-drab Kel-F. Colorants for fluorocarbons must be stable and non-reactive; they must also resist high molding temperatures



Courtesy U. S. Gasket Co.

Teflon electrical spaghetti and beading is produced in various colors for identification purposes

factory, as there are other factors involved.

To the Kel-F and Bakelite Fluorothene resins, the second factor of importance is the need for a pigment that is relatively non-reactive with the polymer. Since certain compounds used by pigment manufacturers will be reactive, very careful selection and control of the basic chemical compositions and combinations of the pigments must be made.

Such reactivity can and will cause severe degradation in the resin, measured by a decrease in viscosity and an increase in flow brought about by an actual polymer breakdown due to pigment addition.

Color stability must, in addition to temperature requirements, include stability to the chemical factors of weathering. The colorants must also be acid and alkali resistant, non-bleeding in nature, of satisfactory fineness, and non-conductive to electricity.

Hiding and tinting power is also a factor in proper color selection, but is more generally related to percentage requirements for product design and sales appeal.

Pigment Selection

In general, the most successful and most widely used type of colorants—from a standpoint of stability and non-reactivity—are the intimately mixed, calcined inorganic pigments. These colors can be composed of such compounds as iron, chrome, zinc, copper, cadmium, and many other oxides. These intimately mixed compounds are calcined at temperatures ranging from 1000 to 2300° F. which remove all volatiles causing color instability. (3)

There are, of course, other pigments that have been found satisfactory for use with fluorocarbons, some of which would be classified as raw material pigments such as rutile type, titanium dioxide (white), and chrome oxide (green). A synthetic inorganic compound known as ultramarine blue also has limited usage, as do organic pigment additions of

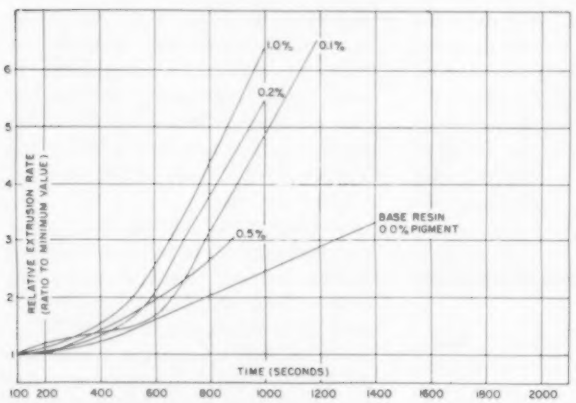
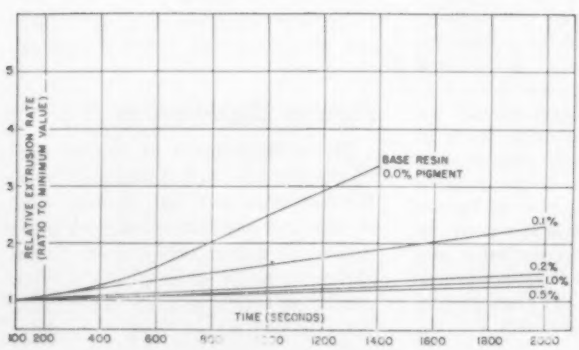


Fig. 1—Degrading effect of iron oxide on Fluorothene, as indicated by a sharp increase in extrusion rate with an increase in percentage of oxide



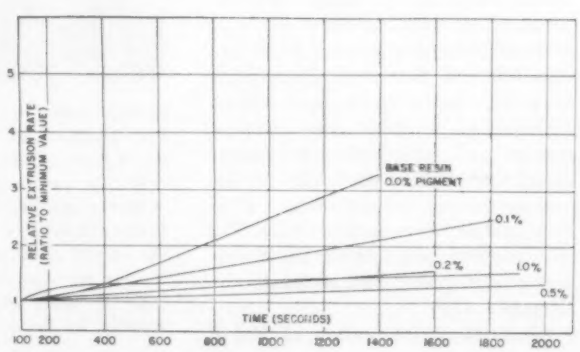


Fig. 2 (left) and Fig. 3 (right) show no degrading effect on Fluorothene by addition of cadmium yellow and red, respectively

the phthalocyanine greens and blues in Teflon resins, if not processed at too high a temperature.

Of greater significance, however, are those pigments and compounds which have a detrimental effect on these polymers, for it is through a process of elimination that knowledge is gained of those colorants which are deemed satisfactory for proper color selection.

Two inorganic compounds that have been found to cause severe degradation or breakdown to the Kel-F and Fluorothene type polymers are iron and copper. In calcined pigments, these materials are used to produce browns from buffs to deep red and chocolate, plus blacks. Iron oxide is commonly used as a pigment in its raw form, again covering a range from light yellow brown to deep red and black. It should be noted, however, that no such degradation has been observed with these type colorants in Teflon.

To substantiate this degrading effect of iron oxide on Fluorothene, reference is made to Fig. 1. This graph was prepared by a comparison of the rate of extrusion versus time. The sharp increase in extrusion rate per second with higher percentage iron oxide additions shows the detrimental effect on flow viscosity. This, in turn, relates to polymer breakdown due to pigment addition and indicates that such color additions

(*To page* 224)



Colors for Polyesters

by Merle Cowee and E. W. Moffett

EARLY uses of polyester resins did not require colorants, but after the materials became available for civilian use there was an immediate and natural demand that the finished product be furnished in color. Fortunately pigmentation could be handled relatively easily.

The diversified applications of polyester resins require that the colorant possesses light permanence for outdoor applications; heat stability for high temperature molding applications; hiding power to mask fillers with minimum loss of brilliance; tinting strength to hide the fibrous glass fiber pattern with the least amount of colorant; and chemical inertness so as not to affect the curing behavior of the resin. The colorant must also withstand the attack of the peroxides used in curing the resins. Furthermore, the cost must be such that the final product will find a market.

Few pigments possess all these properties, so compromises must be made. In general, inorganic pigments are superior in light and heat stability while organic "lakes" or "toners" and dyes possess the best hiding power and tinting strength. Individual members of both classes may affect the cure rate of the resins used and some organic lakes change color due to solubility in the resins.

Methods of Adding Color

Several methods may be used to produce colored articles from polyester resins but, because of their limited storage life, the resins are supplied in clear form and the fabricator adds the color before processing. This procedure does not add materially to the fabricator's cost, because the peroxide catalyst used must be mixed thoroughly with the resin before use.

Paste Concentrates—In the most common and satisfactory procedure, the resin supplier or a pigment dispersion manufacturer offers various color pastes which may be added to polyester resin. This method was borrowed from the common paint practice of preparing a highly viscous milled paste which is later reduced with additional vehicle. The dispersions vary in viscosity from pourable to heavy, non-flowing pastes, depending upon the vehicle, type of pigment, and the formulation.

Such pastes may be dispersed readily in polyester resins of conventional viscosity. Generally, small particle size produces maximum hiding, thereby taking full economic advantage of the pigment present. Full opacity with most commercial pastes can ordinarily be obtained through the use of 2 to 5 parts paste to 100 parts resin. The fine grind, along with the desire to keep the pigment concentration as high as practical, makes the production of non-settling pastes possible. The amount of paste used can be varied at will to produce finished articles varying from complete opacity to 75% translucency.

Certain disadvantages exist in this



Merle Cowee graduated from the University of Illinois with a B.S. degree in chemistry in 1946. Prior to 1950 her work was with color and color measurements, particularly in the vinyl field. Since that time she has been associated with Pittsburgh Plate Glass Co. Her responsibilities have included research on pigments and dyes for use in polyester resins, the coloring of polyester resins and ways of improving it, and the devising of suitable control tests for application in the production of color paste concentrates.



Eugene W. Moffett received his B.S. degree from Monmouth College in 1929 and his Ph.D. from Northwestern University in 1932. Dr. Moffett has been associated with the plastics field since graduation, his first work being done with rubber hydrochloride and related materials at The Marbon Corp. He has been associated with Pittsburgh Plate Glass Co. since 1937, working in the fields of vinyl plastics, paint vehicles, and polyester resins. At the present time he holds the position of technical director of research and development for Selectron polyester resins.

system of coloring polyester resins. The introduction of any grinding vehicle has some softening effect on the cured resin. If the amounts used are kept low, the effect is negligible. The pastes may have somewhat limited storage life depending upon the type of grinding vehicle used and the chemical activity of the pigment or pigments involved. Also, in matching a color, several pigments may be required and, if these differ greatly in density, some separation may occur in storage. However, many high quality pigment pastes presently available can be stored for a year or more without deterioration. In some pastel color pastes it has been noted that a lightening in shade occurs on storage. The final consideration is economic and it is a notorious fact that milling operations of the type involved here are expensive. Fortunately, the fabricator uses a relatively small ratio to achieve his goal.

Dry Powders—Pigments in the dry state may be stirred into polyester resins prior to the addition of the catalyst. The pigments used in this manner are the same ones employed in paints and other plastics. The advantages of this method are: 1) No storage life or settling problem is involved. 2) The fabricator can blend pigments at will to obtain any color desired. 3) The cost of pigmentation is lower. This process has several disadvantages and two are rather serious. Even though the pigment has a fine particle size, complete dispersion is nearly impossible. Some clumps or agglomerates remain. These show up in the finished article either as dry spots of different color or in non-uniform color density. Longer mixing times or even overnight standing after mixing will reduce this difficulty, but such practices are more expensive. The full hiding power of a given weight of pigment is not developed and a greater amount must be used to obtain the same degree of opacity, particularly if no fillers are used. If different colors are used at the same time in the mixing room, dusting and contamination present a minor problem.

Dyes—The role of dyes in polyester resins has been restricted, primarily because complete transparency is desired in relatively few products. It is believed that no true dyeing action takes place with polyester resins. The dyes are simply dissolved in the cured resins. Usable dyes must be soluble in a solvent compatible with polyester resins or dissolved directly in them. The former practice is generally used. When possible, polymerizable monomers such as styrene or diallyl phthalate are used as solvents. Many soluble dyes are not useful because of poor stability, either to light, heat, or organic peroxides.

Pigmented Polyester Resins—Mention must be made of the practice of milling pigments in a polyester resin. The resins must be of sufficiently low viscosity to permit ball mill grinding. This grinding method prevents evaporation of the monomer. This procedure is used chiefly in preparing overlay resins which are sprayed on the mold prior to the actual molding operation. Overlays in white, grays, or light pastels are made by this procedure, although other pigments can be handled similarly.

Table I—Pigment Properties in Polyester Resins

Pigments	*Light Stability*	*Heat Stability*	*Hiding Power*	*Chemical Inertness*
WHITE				
Titanium dioxide	Fair	Good	Good	Inert
Zinc oxide	Fair	Good	Good	Very powerful inhibitor
BLACK				
Lamp	Good	Good	Good	Powerful inhibitor
Carbon	Good	Good	Good	Powerful inhibitor
Iron	Good	Good	Poor	Inert
YELLOW				
Cadmium	Good	Good	Fair	Inhibitor
Chrome	Poor	Good	Good	Inert
Hansa	Poor	Fair	Good	Inert
Ochre	Good	Good	Good	Inert to accelerator
RED				
Cadmium	Good	Good	Poor	Inhibitor
Lithol	Poor	Poor	Good	Slight inhibitor
Para	Poor	Poor	Good	Inhibitor
Toluidine	Poor	Poor	Fair	—
Iron oxide	Good	Good	Good	Inert
ORANGE				
Cadmium	Good	Good	Poor	Inhibitor
Molybdate	Poor	Good	Good	Inert
Chrome	Poor	Good	Good	Inert
GREEN				
Hydrated chrome oxide	Good	Good	Poor	Inert
Chrome	Poor	Good	Good	Inert
Phthalocyanine	Good	Good	Good	Inhibitor
BLUE				
Cobalt	Good	Good	Good	Inert
Iron	Fair	Good	Good	Inhibitor
Ultramarine	Fair	Good	Poor	Inert
Phthalocyanine	Good	Good	Good	Inhibitor
BROWN				
Raw sienna	Fair	Good	Good	Powerful accelerator
Burnt sienna	Good	Good	Good	Inert to slight accelerator
Raw umber	Fair	Good	Good	Powerful accelerator
PURPLE				
Tungstated toner	Poor	Good	Poor	Inert

This procedure is used because the skin of overlay resin hides the characteristic fibrous glass pattern and eliminates the cost of coloring the molding throughout its thickness. Another advantage is that there is no need to consider the plasticizing acton of the grinding vehicle, because the resin itself is used.

It might, therefore, be asked: Why not use this procedure in preference to all others? The answer includes the following factors: 1) Fabricators may use several resins and want to mold them in different colors so that resin inventory becomes a problem. 2) Control of the spraying operation is impractical in many molding applications. 3) Storage stability of pigmented resins is often much poorer than unpigmented resins. 4) Settling during storage and shipment occurs with some pigments, because low viscosity resins must be used. 5) The grinding operation develops heat and this usually affects the gel and cure times of the final product. Control of this latter factor by the manufacturer is difficult.

Colorant Properties

The generally accepted properties of pigments are not necessarily duplicated in the polyester resins. The pigments may exhibit unexpected characteristics, because of either the polyester medium or chemical reactivity with catalysts and inhibitors. The properties of pigments often used in polyester resins are summarized in Table I. The information in this table is presented merely as a guide. The ratings in the first three columns are accurate, but the chemical inertness depends somewhat on the polyester used and the catalyst system employed.

Pigmentation Problems

It might be concluded from the foregoing that pigmentation, by one of the methods described, is relatively easy. Anyone experienced in the field knows that this is not true. In practice, pigments that do not affect gel and cure times are exceptions rather than the rule. Undesirable acceleration or prolonged cures are both objectionable. In some instances, adjustment of catalyst concentration and cure schedules by the molder or fabricator are necessary, because satisfactory replacements cannot be found for present colorants. As an example, cadmium red pigments are very stable to heat and weathering, but they behave like inhibitors during the cure. The degree of inhibition is dependent on the catalyst used, as illustrated by the examples given in Table II.

Table II—Effect of Pigments as Inhibitors

Pigment Used	*Catalyst Name*	*%*	*Gel time at 180° F.*	*Cure time at 230° F.*
None	Benzoyl peroxide	1.0	330 seconds	2.0 minutes
Cadmium lithopone Medium light red	"	"	401 "	3.0 "
Cadmium lithopone Maroon	"	"	736 "	3.0 "
None	Cumene hydroperoxide	0.6	200 "	5.5 "
Cadmium lithopone Medium light red	"	"	767 "	14. "
Cadmium lithopone Maroon	"	"	367 "	13 "

Resins available from different suppliers, or even one supplier, are often stabilized with different inhibitor systems and may behave quite differently with a given color paste or pigment. This is exemplified by the results obtained with a black paste concentrate using resins of similar type from three manufacturers (Table III). The paste was claimed to be non-inhibitory, but the inhibition encountered in Resin B could not be tolerated in most manufacturing operations. The catalyst used was 1% benzoyl peroxide and all other conditions were comparable.

Similarly, variations in the final color can be caused by different inhibitor systems. This is generally not true with inorganic pigments, but may occur with organic types. A B.O.N. red, Du Pont's 525RT, illustrates this behavior. When this pigment was used in low concentration with resins from three suppliers, a rose red color was obtained; an orange red was produced in resins from three other suppliers. In addition to these types of variations, and in spite of the control presently practiced by reliable pigment manufacturers, some variations do occur from batch to batch. These variations usually do not affect heat or light stability but do cause slight variations in color and, sometimes, variations in gel or cure times.

These examples are merely indicative of the problems encountered. The many factors influencing the coloring of polyester resins require that the molder or fabricator not only cooperate fully with his pigment supplier and follow the latter's recommendations but also test each colorant used so that its behavior in production is known and the final product will meet specifications.

Conclusions

The field of colorants for polyester resins offers a challenge to pigment manufacturer, paste supplier, and fabricator alike. Present requirements indicate the need for pigments that are 1) more permanent under ordinary weathering conditions, and 2) less chemically active under polyester curing conditions. While cost is important, the industry is showing a willingness to use expensive materials to obtain improved quality. New improved colorants for this field will undoubtedly be found.

Table III—Inhibitive Effect of Paste Concentrate on Three Resins

Resin	*Cure time at 230° F. Clear resin*	*With paste*
Mfr. A	3.0 min.	4 min.
" B	3.5 min.	10 min.
" C	1.0 min.	2.5 min.

New Limbs for Amputees

Strength and light weight of reinforced plastics are prime advantages in custom-made artificial arms and legs



Polyester resin mixture being poured into tight-fitting P.V.A. bag to impregnate cotton and glass fabric laid up on breakout at bottom



Resin is forced into cloth lay-up by "milking" resin-filled bag above mold until fabric is fully impregnated

Photos courtesy American Cyanamid Co.



Lightweight yet strong, reinforced plastics artificial limb is odorless and easily washable

LONG and varied is the list of applications of reinforced plastics, yet new ones are added almost daily. Many of them represent volume consumption of resin; others are on a smaller scale but are of utmost importance to their users. Such is the case of artificial limbs—long fabricated of wood and leather—which are now being made of polyester resin, reinforced with cotton and glass fabrics.

Aside from mechanical joint improvements, the use of polyester resin and glass cloth, instead of wood or leather, provides the major advantage of light weight together with great strength. The average weight of the new upper and lower extremities, together with elbow socket, is about two pounds. Light weight, of course, is an aid to the efficiency of the arm amputee.

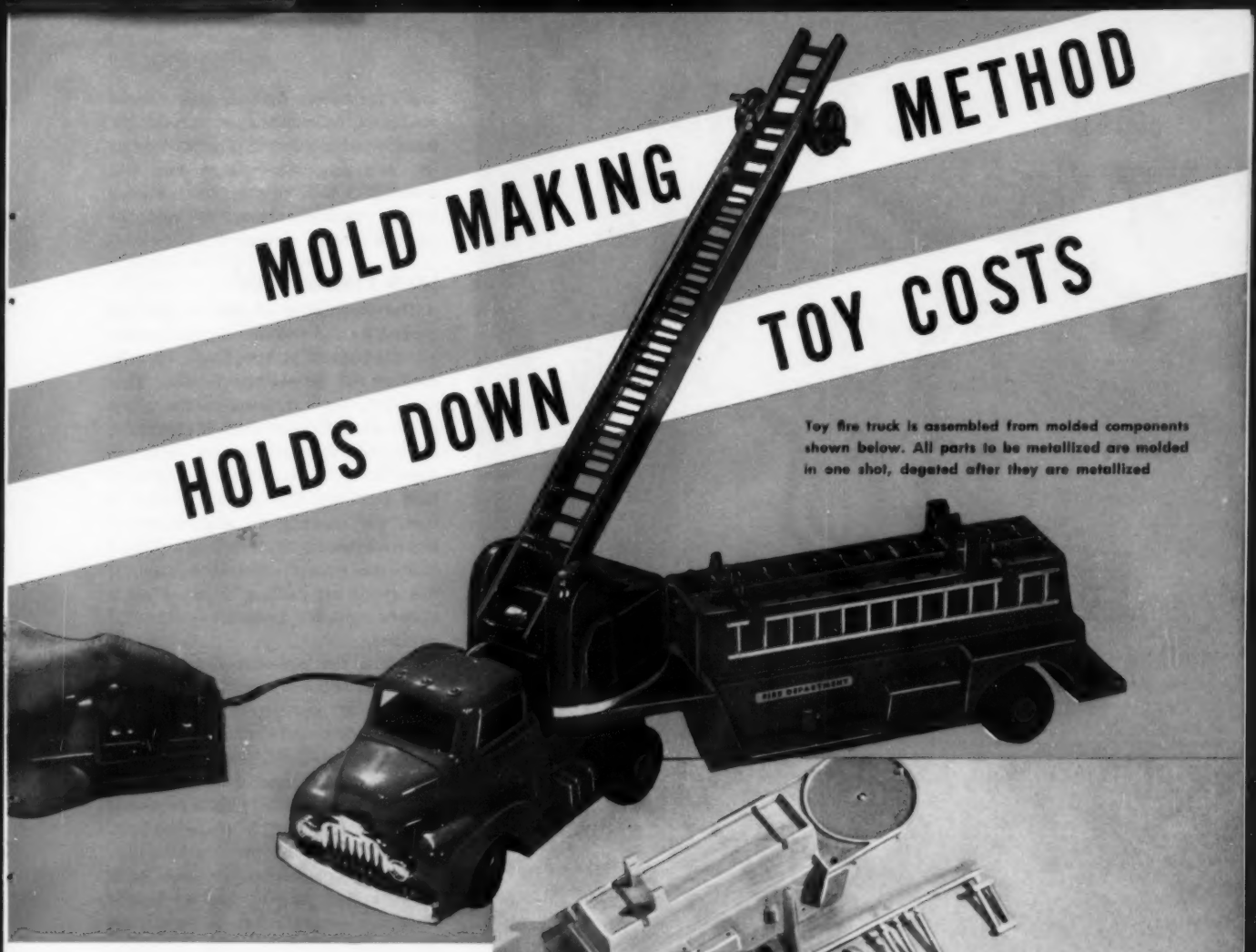
From the appearance viewpoint, the reinforced plastics limbs are especially advantageous because of their molded-in flesh tint. The color can't chip or peel off. Unlike leather, reinforced plastics will not stretch, do not have an odor, and can be washed easily and kept sanitary. Virtually no one seems to be allergic to this material.

Laminac resins 4134 and 4116 are used together with glass cloth by J. E. Hanger Co., St. Louis, Mo., in the fabrication method recommended by the Advisory Committee on Artificial Limbs, established by the National Research Council at the request of the Surgeon General of the Army. A wide range of rigidity can be achieved by simply altering resin proportions.

Production Technique

The production method consists essentially of laying up several layers of cotton stockinette and two layers of glass cloth over a plaster mold or "breakout." This is then enclosed in a tight covering of polyvinyl alcohol plastic sheet made into a conical sleeve, which, when pulled on tight, and tied at one end, constitutes a bag. The Laminac resin is poured into the top of the bag and then is squeezed by hand down into the cloth laminates by "milking" the resin-filled bag above the mold. When the resin has impregnated the cloth and all air has been worked out, the mold, still in the plastic bag, is hung in an oven for initial curing at 130 to 140° F. for about 45 minutes. After gelling, final cure proceeds at a temperature of 250° F. for another 45 minutes.

MOLD MAKING METHOD HOLDS DOWN TOY COSTS



Toy fire truck is assembled from molded components shown below. All parts to be metallized are molded in one shot, degated after they are metallized

A MOLD-making innovation—gravity-casting beryllium copper hobs from plaster molds, and using these hobs for pressure-casting beryllium copper cavities—has made possible the profitable production of a moderate-priced line of motorized plastics toys, remote-control operated from push-buttons located on battery boxes.

Eight types of toys are in the line injection molded by General Molds and Plastics, Inc., Pittsburgh, Pa.—formerly Vibro-Roll Products, Inc. The leader of the line is a realistic aerial-ladder fire truck, with fire-red body and cab, rubber wheels, and chrome accessories and trim. The other toys, similarly made and operated, are a stake trailer, a futuristic sports car, a fire-chief car, a powerhouse tractor, a GI jeep, a hard-top convertible, and a Bell telephone truck.

General Molds and Plastics, founded six years ago to do custom molding, with its own machine-shop



Photos courtesy General Mold and Plastics, Inc.

Part of production line where remote-control plastics fire truck is assembled. Extreme accuracy of component dimensions makes for a relatively easy assembling operation

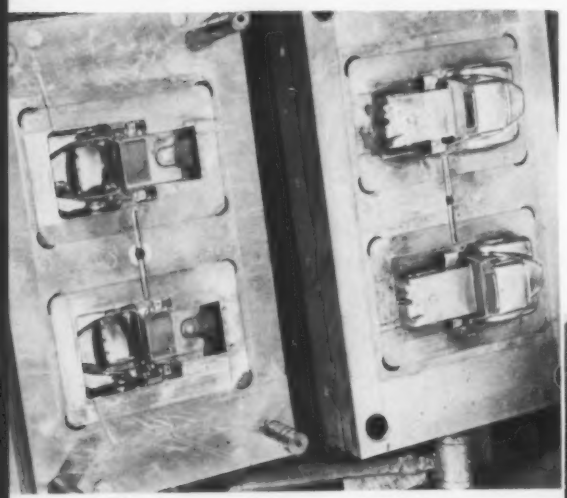
and facilities for design, metal stamping, assembling, and finishing, introduced motorized plastics toys as its own proprietary line, and has developed into one of the nation's largest manufacturers of remote-control novelty items.

From Plaster Model

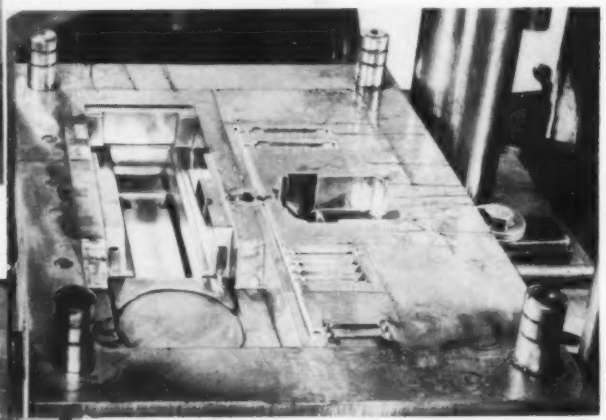
The beginning of the production procedure for the fire engine, as for all the other plastics toys, is the making of a plaster model. This model is then shipped to the plant of Manco Products, Inc., Melvindale, Mich., where it is handled in much the same manner as a pattern in a foundry. The plaster model is used for making an impression in an investment material. Beryllium copper is gravity-cast in this mold; the resulting casting is used as a master hob for pressure-casting of cavities.

Before the pressure-casting step, however, the beryllium copper hob is sent to the toy-manufacturing plant. Here details are checked, any desirable detail revisions made, and the hob is polished.

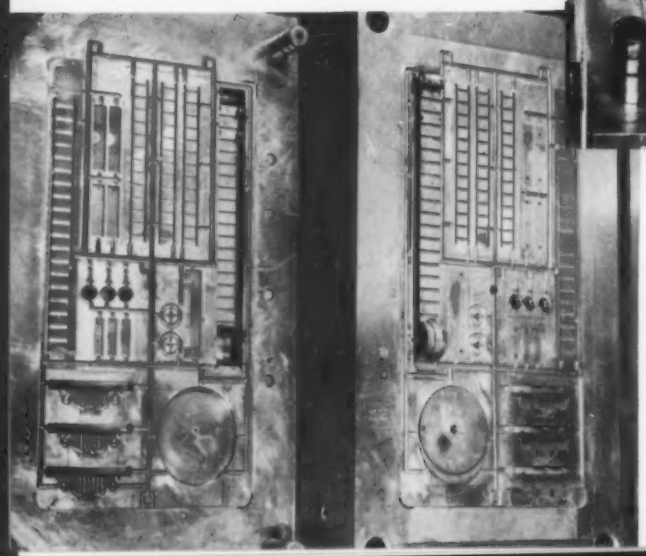
When the polished hob is returned to the Manco plant, it is used to produce the required cavities by pressure-casting—placing the hob in a metal chase, pouring molten beryllium copper around it, and applying and maintaining pressure by means of a hydraulic press until the metal



Mold for cab and front end of toy fire truck. Construction of mold makes possible rendition of minute design details



Body for the ladder trailer and housing for the ladder elevating mechanism are both produced in a single mold



All parts of the fire truck to be vacuum metallized are produced in a single set of beryllium copper cavities

has solidified. The resultant cavities are shock and corrosion resistant and extremely strong, with uniform hardness and density.

Most of the plastics toys in the line are injection-molded from Eastman's Tenite acetate, with Koppers styrene used for a few.

Four molds are used in making the fire engine, which is 16⅜ in. long, 3 11/16 in. wide, and 4 11/16 in. high. A 75-girl assembly line is employed for insertion of the motors and putting together of the various parts and accessories. The only part of the manufacturing procedure which is not done in the molder's factory is the vacuum plating of the silver-colored parts: the "chrome" body trim, the movable aerial ladder, and the hook-on ladders. This vacuum plating is performed by Metalplast Process, Inc., Woodside, N. Y.

According to Andre Giardina, president of General Molds and Plastics, Inc., production of the toys would be an economic impossibility if it were not for the Manco method of working from plaster models to obtain accurate mold components from beryllium copper hobs.

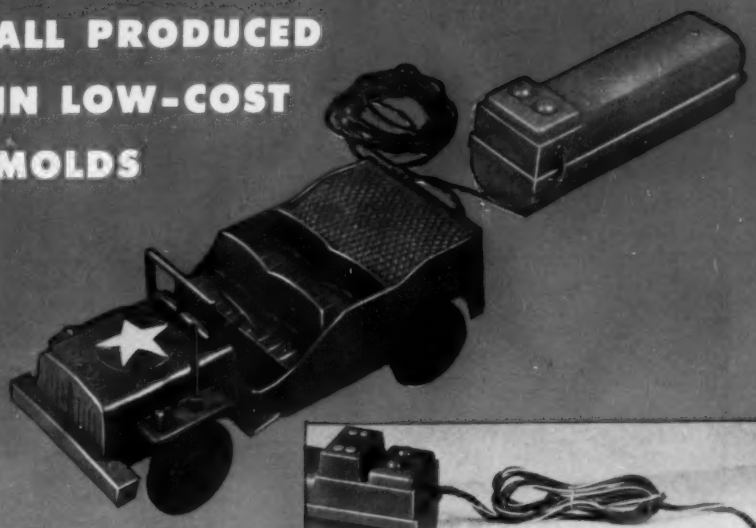
Another advantage cited by Mr. Giardina is the fact that the necessary polishing can be done on the positive surface of the male form—the beryllium copper hob. The lustrous finish thus achieved is transformed to the pressure-cast beryllium copper cavity, and no polishing inside the cavity is required.

Toys in Use

One-hand operation is all that is required of the juvenile user of the fire truck. Two ordinary flash light batteries are inserted in the plastic control box, which operates two motors—one to propel the truck forward and in reverse, and the other to raise and lower the aerial ladder.

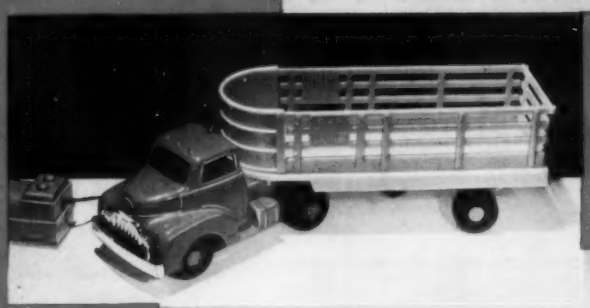
The fire truck—which has a shipping weight of 23 pounds for a carton of 12 individually boxed toys—is retailed at a suggested selling price of $9.95 each. All the toys in the line are marketed through the manufacturer's representative, Colman and Hirshmann, New York, via jobbers, for mail-order sale by such concerns as Sears-Roebuck and Montgomery Ward, and store sale by such outfits as Marshall Field in Chicago and F. A. O. Schwartz in New York.

ALL PRODUCED IN LOW-COST MOLDS





In addition to fire trucks, remote-control plastics toy line includes, top to bottom: army jeep, X-91 Futura sports car (with special control box for quick maneuvering), stake trailer (using same cab as fire truck), Bell telephone repair truck, and fire chief's car









Courtesy S. C. Johnson & Son, Inc.



Sturdy, functional polisher head is injection molded of cellulose acetate
Courtesy Eastman Chemical Products, Inc.

Trouble-Free WAXER

Design of cellulose acetate applicator-polisher head gives functional beauty plus ample strength to take abuse

TO THE long list of plastics products which have been devised to make things easier for today's housewife, add the new Beautiflor waxer developed by S. C. Johnson & Son, Inc., Racine, Wis., for applying its Beautiflor liquid wax. With this convenient new device, any homemaker can keep her floors gleaming with beauty—without getting down on hands and knees and resorting to tedious scrubbing and rubbing.

The Beautiflor waxer consists of a sturdy plastic head, injection molded of green cellulose acetate, combined with an aluminum pan which snaps in place on the underside to hold a chenille pad. After the 48-in. Douglas fir handle has been inserted in the socket on the top of the unit, it is ready to be used in applying the wax to floors and then polishing them to a high lustre.

Can Take Abuse

The selection of cellulose acetate for the new waxer head was based on several considerations, including its ability to withstand repeated contact with the liquid wax without affecting the surface finish and its range of integral colors, ease of molding, resilience, and durability, all of which insure that the waxer head will stand up for a long period of trouble-free service. According to Bill Harris, Johnson designer who worked out the styling and construction features of the Beautiflor waxer, an injection molded plastic type of head was chosen because "plastic offered lower cost, a good looking finish, rapid production, permanence of color, and non-marking and impact-resistant features."

Can this plastic component really "take it?" Mr. Harris answered that question convincingly for a recent plant visitor by hurling one of the heads against a brick wall with the full power of his 200-lb. frame behind it. The unit bounced off the wall unmarked and unharmed.

"See," he remarked, "not a mark on it. Of course, it *can* be broken or marred, but the average housewife isn't likely to treat it roughly enough to break it." In other demonstrations at the Johnson plant, the waxer head was run over by an automobile without damage.

Functional beauty keynotes the design of the molded plastic head. Its attractive styling, as viewed from above, is evident in an accompanying close-up illustration, which shows the waxer ready for use with the pad in position. This photograph brings out such details as the smoothly rounded corners of the plastic head, the top ridges which add character and visual interest to the upper surface, and the manner in which the handle socket is blended integrally into the head.

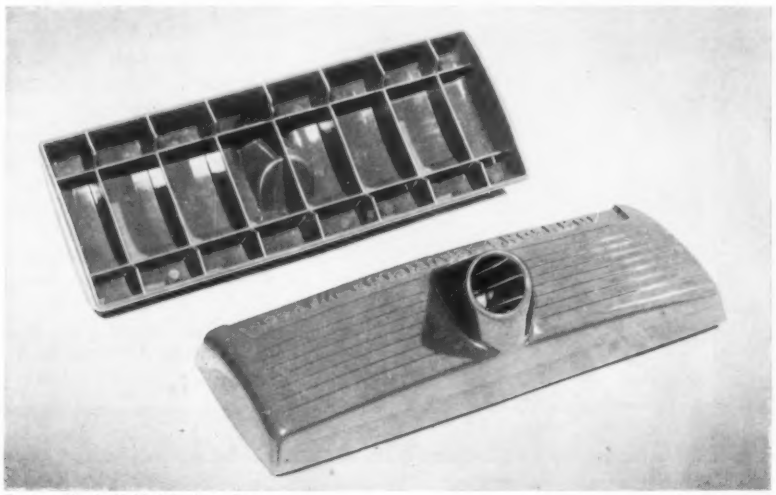
Other design details, not so readily

apparent to the casual observer, contribute much to the sturdiness and serviceability of the plastic head. The underside of the head has a series of seven transverse reinforcing ribs, as well as two longitudinal ribs near the front and back of the part. These integrally molded webs, some as deep as $^{13}/_{16}$ in., are an important factor in giving the head the desired strength and dimensional stability.

Another design detail involved the method used to obtain a secure fit between the head and the shank of the wooden handle. A plain tapered socket would probably have required use of an adhesive. A screw-in arrangement, on the other hand, would have involved molding internal threads in the plastic head socket and turning male threads on the end of the handle—operations which would decrease production speed and increase production costs. The designer's answer to this problem, based on earlier experience with a maintenance applier, was to specify a head socket with a series of longitudinal ribs. When the handle is forced in place in the socket, the ribs squeeze tightly against the wood and prevent turning or loosening of the handle. With this arrangement, shank dimensions of the handle can vary within a considerable tolerance without causing an unsatisfactory fit.

Plastic heads for the new Beautiflor waxer are being produced by three custom molders, each using a two-cavity mold. To guard against distortion of the part, which must remain in accurate alignment so the aluminum pan will snap on tightly, multiple knock-out pins are used on the punch side of the die, between the reinforcing ribs, and the pieces are placed in cooling fixtures for a short time after removal from the injection machines. Side cores in the cavity side of the mold, operating at 45° to the top surface of the part, form the handle sockets with their eight internal ribs.

At the plant of Wells Specialty Co., North Liberty, Ind., which handles final assembly and packaging of the waxers, six complete units are packed in display-type shipping cases. Each Beautiflor waxer includes—in addition to the molded plastic head—the wooden handle, aluminum pan or bottom member which holds the pad in position, two chenille pads, a steel wool cleaning pad, and a pint of the wax. Sales results as well as surveys among purchasers have proved that consumers like the sturdiness, attractiveness, light weight, and reasonable price of the new unit. In fact, it might even be said that "housewives wax enthusiastic about it."



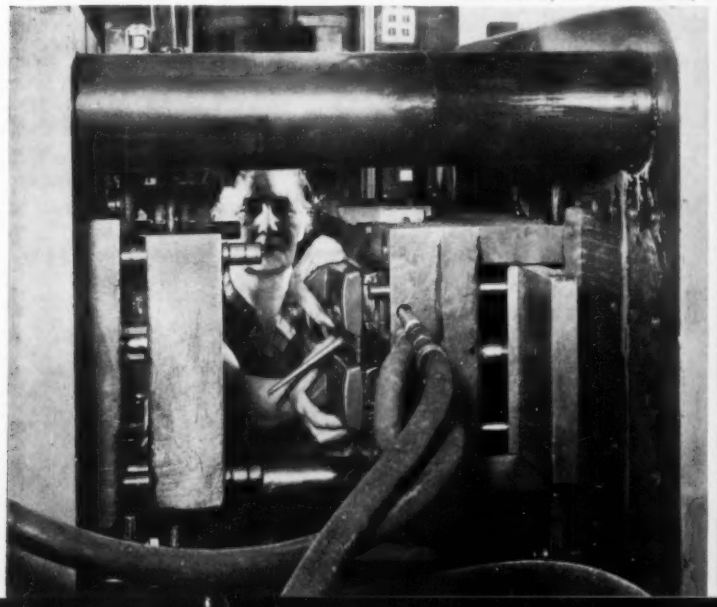
Courtesy Plastic Molded Products Co.

Waxer head was designed for ruggedness and serviceability; reinforcing ribs molded into underside prevent warpage and sagging, ribs in handle socket obviate socket threading

CREDITS: Tenite cellulose acetate heads for the Beautiflor waxer molded by Milwaukee Plastics, Inc., Milwaukee 16, Wis.; Plastic Molded Products Co., Chicago 30, Ill.; and American Plasticraft Corp., Chicago 22, Ill.

Shot of waxer head is removed from two-cavity mold. Handle sockets, at 45° angle to surface of the head, are formed by oblique cores located on cavity side of mold

Photos courtesy Milwaukee Plastics, Inc.



Only finishing operation required is the degating of the parts. Gates are located at each end of the waxer heads



PLASTICS

Miniature Doll Shoots Water Pistol

Depressing the cowlick of a 5½ in.-high version of Dennis the Menace, causes the doll to shoot its water pistol. Molded of yellow medium-impact styrene, the water shooting doll has a vacuum plated pistol and other features hand-painted in four colors. The doll contains a small internal rubber bulb which forces water through the pistol arm when the cowlick is depressed. When the cowlick is moved, it activates a cam arrangement which raises the pistol arm and compresses the rubber bulb which ejects a stream of water.

Loading the doll is accomplished by depressing the cowlick and inserting the pistol in water. Suction is created when the cowlick is released. The bulb will hold enough water for 2 or 3 shots.

Component parts include the front and back halves, upper and lower cams which compress the bulb, and the inner and outer right arm pieces, which form a water channel through the arm and pistol when cemented together. All parts are molded of medium-impact polystyrene material in a 6-oz. injection molding machine using a 12-cavity family mold.





CREDITS: Molded and assembled for Active Toys, Inc., 57 E. Ohio St., Chicago, Ill. by Trans-Matic Plastics Co., 5506 W. Montrose, Chicago, Ill.



Cash Box with Tilting Tray

Cash box called "Cash-A-Flash," molded of C-11 styrene copolymer, has a coin capacity of $62.50 in all denominations. The cash box is opened by pressing two push buttons on the front of the box. An enclosed coin tray tilts up on retarded click springs. Coins are sorted and counted by means of metering slots in the coin tray. The amount in dollars and cents are shown on the edges of the slots. The cover is removable, as is the coin tray. Sponge rubber strips in the top hold coins securely in the slots so that the box may be carried in any position.

Three single cavity molds are used for production of the box lid, bottom, and coin tray. One family mold produces the coin tray lifter, auxiliary dime tray, and the two push buttons. All molds are used on an 8-oz. injection molding machine.

CREDITS: Molded by Holiday Mfg. Co., Grand Island, Neb., for J-P Products, Box 84, Sabetha, Kansas. C-11 supplied by Bakelite Co., Div. Union Carbide & Carbon Corp., New York, N. Y.

PRODUCTS

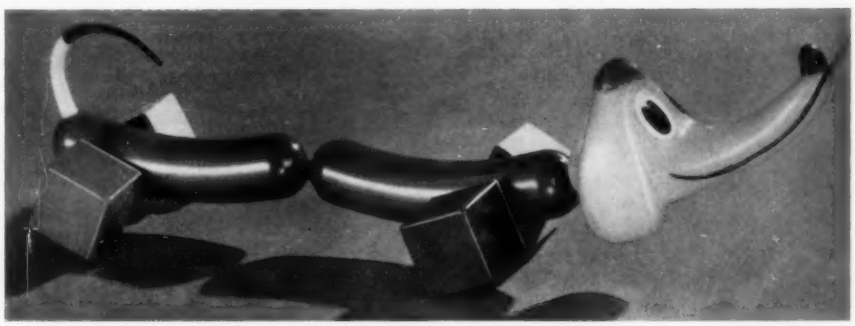
Pull Toy with Flexible Vinyl Links

Hot dogs, blocks, a tail, and a comical dog's head are combined to form Kweenie the Weenie, an all-plastic pull toy. The head, body, and axles are injection molded of high-impact styrene. The cubical wheels are molded of general-purpose styrene and the flexible tail and links are vinyl. The body is formed of two simulated hot dogs joined sausage-link fashion to the head by means of flexible vinyl links. The links allow the necessary degree of flexibility to produce lots of fore and aft motion when the toy is pulled. A pull cord is attached to the dog's nose.

Head and body sections are molded in half sections and cemented together with multiple drying jigs. The links are inserted into the hollow sections prior to the cementing operation. The wheels consist of two sets of blocks cemented on axles, the blocks on one side being mounted at a 45° angle to those on the other to permit the axle to rotate when the toy is pulled. Axles are molded separately and cemented to the block caps which are then permanently mounted to the block wheels.

The head section is molded in a 4-cavity, the body in an 8-cavity mold, both on 8-oz. machines.

CREDITS: Molded and assembled by Kusan, Inc., 2716 Franklin Rd., Nashville, Tenn.

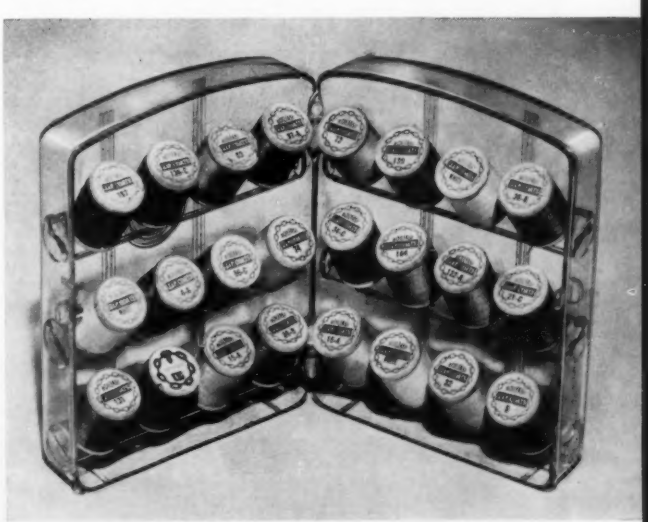


Transparent Thread Box Holds 24 Spools

Thread box molded of transparent styrene will hold up to 24 spools of thread in a compact package. The box features six shelves, three in each section, that can be tilted forward when the thread box is open and in an upright position. Each shelf accommodates four spools. Enclosed retaining ridges molded into the sides of the box permit the shelves to tilt forward at a 45° angle. Spools of thread cannot fall out either in the open or closed position because of this angle. The spools can be removed by lifting each off the holding spindle.

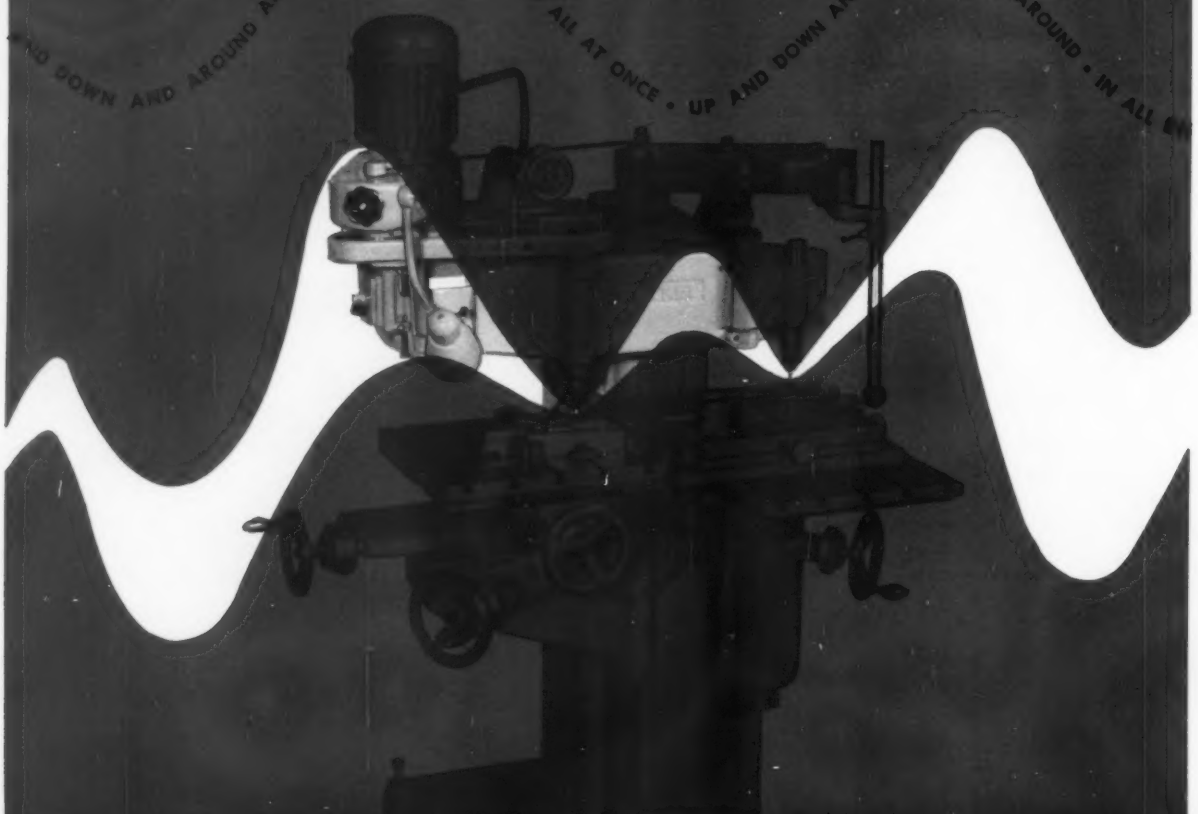
The thread box consists of three separate parts: the front and back box sections and the shelves. The complete unit is molded in an 8-oz. injection molding machine using an 8-cavity family mold. The two box units are hinged together by means of molded-in hinges. A snap lock holds the box firmly closed.

CREDITS: Molded and assembled by Wes-Ko Products, 3536 Union Pacific Ave., Los Angeles 23, Calif. Styrene supplied by The Dow Chemical Co., Midland, Mich.



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Upgrading Fluorocarbon Moldings

Higher quality polychlorotrifluoroethylene parts are produced by bringing material to molding temperature in hot runners of special design

by Carmen R. Giannotta†

THE unusual and useful physical properties of Kel-F[1] (polychlorotrifluoroethylene) are becoming of more and more interest to molders as volume production of the basic molding material increases and price decreases. And because the material is a high-temperature thermoplastic, it is natural to assume that special molding techniques are required when working with it.

Through recent developments in the use of hot-runner molds for injection molding of Kel-F, it now appears possible to minimize scrap, reduce material degradation, and produce higher quality molded pieces with less orientation.

With most common thermoplastic materials, the difference between the flow temperature of the material and the temperature of degradation is relatively large. This means that the material can be heated to a temperature in an injection cylinder at which it will retain a state of reasonable fluidity when flowing through the sprues, runners, and gates of a typical injection mold. In addition, the viscosity of these materials, when they are in a flowable state, is relatively low, allowing the material to be forced again through the runners, sprues, and gates with relative ease.

Narrow Temperature Range

Kel-F plastic, in an unplasticized state, has a relatively narrow temperature range between the point where it is plasticized and the point where material breakdown or degradation takes place. Degradation means that a cleavage of molecular chains takes place, reducing the apparent molecular weight of the material, and resulting in a reduction of the effectiveness of inherent physical properties. In addition, Kel-F plastic, in its flowable state, exists as an extremely high viscosity material and, being such a viscous material, its flow characteristics are in general poorer than other thermoplastics. Therefore, when injection molding Kel-F thermoplastics, the material must be at a temperature which is just below that of rapid degradation, yet high enough to plasticize the material.

If the material is not completely flowable or cools to a point below its flow temperature while flowing through the sprues, runners, and gates into the cavity, Kel-F polymer plastic will then become oriented to a varying degree, depending upon the conditions of injection. Orientation means that the molecular chains are aligned in a direction parallel to

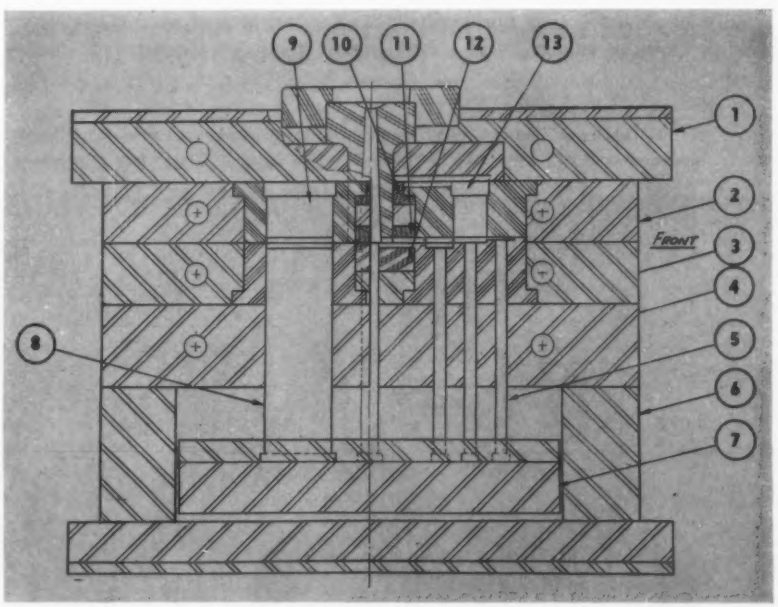


Fig. 1—Diagram of side-gated four-cavity mold set-up in which the runner system is on the same mold parting line as the cavities. With such a set-up, sprues, runners, as well as the molded part are removed from the mold as one unit. Mold components are identified as follows: 1—backing plate; 2, 3—cavity plates; 4—back-up plate; 5—knock-out pins; 6—spacers; 7—knock-out plate; 8—disk knock-out pin; 9—cavity; 10, 11—blocking plates; 12—sprue holder; 13—filler piece or bushing, as required

* Reg. U. S. Pat. Off.
† Technical Service Representative, Chemical Mfg. Div., The M. W. Kellogg Co., a subsidiary of Pullman, Inc.
[1] Registered trade mark of The M. W. Kellogg Co., for their fluorocarbon polymers.

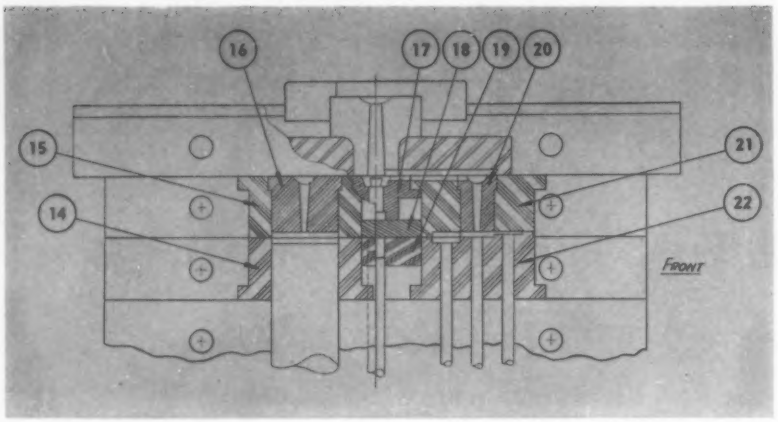


Fig. 2—Diagram of center-gated mold set-up. In this design, runner system and cavities are not on same mold parting line. Mold components are: 14,15—cavity block; 16—feed bushing; 17,18,19—blocking plate; 20—feed bushing; 21,22—cavity block

the force that is forcing them through small orifices. This has the effect of increasing the tensile strength in one direction and decreasing it perpendicular to that direction.

Mold Types

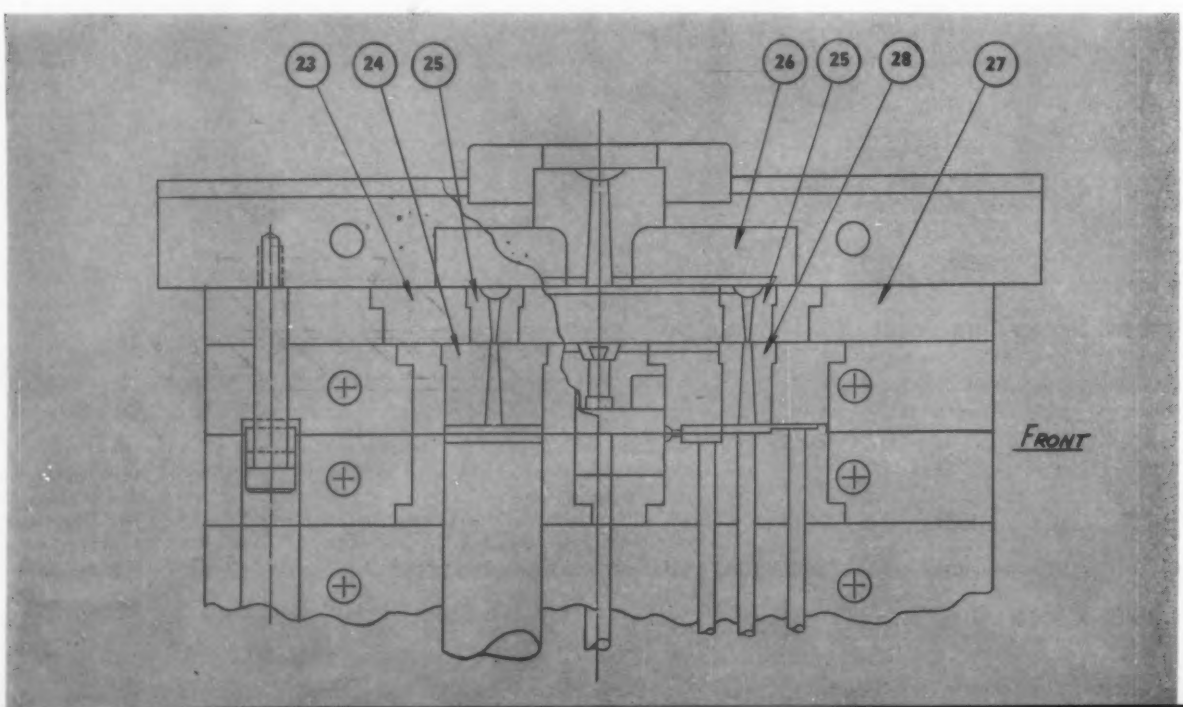
Therefore, in injection molding of Kel-F plastics the material should be maintained in a flowable state without overheating, up to a point as close to the cavity as possible, and should be moved into the cavity as rapidly as possible, using the largest possible sprue, runner, and gate commensurate with the part being molded.

In general, there are two types of multiple-cavity molds used for injection molding. One is a side gated mold where the material travels through a sprue bushing, into a cold slug well, through a runner system and gates, and into the cavities. The runner system is on the same mold parting line in this type of mold as the cavities (Fig. 1) and the sprue, runners, and molded parts are removed as a unit.

Another type of mold is the center gated mold. In this type of operation, the material travels through the sprue bushing and runner system and through an auxiliary sprue bushing and then into the cavity (Fig. 2). In this case, the runner system is in a position other than at the parting line of the cavities. In normal operation, this necessitates a three plate mold and the sprues and runners and molded parts would be removed in separate operations; that is, the cavities would be removed from an opening which takes place along the parting line of the cavities and the runners and auxiliary sprues would be removed from an opening that occurs along the center line of the runners.

These, in general, are the types of molds that have been used up to the present time for injection molding of Kel-F, using multiple cavities. Recommendations have been made that the mold, including runner and cavity plates, clamping plate, etc., be kept at a minimum temperature of 300°F. However, even with the mold at 300°F., and the Kel-F in the cylinder at a temperature of approximately 525 to 540°F., there is a cooling effect as the material travels from the injection machine nozzle to the cavities. During this period, there is a tendency to cool the material and to produce orientation in the piece during this travel. Since the material next to the metal cools the fastest, the hot material

Fig. 3—Schematic diagram of four-cavity mold set-up for hot-runner molding. Mold components are identified as follows: 23—runner plate insert; 24—cavity bushing; 25—feed bushing; 26—runner plate insert; 27—runner plate; and 28—cavity bushing



Handles, legs and various knobs of Alcamatic cooking utensils, now being made on Stokes fully automatic molding presses by Eastern Metal Products Co., Tuckahoe, N.Y., at two-thirds below previous costs.



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travels through the center insulated core.

In order to produce acceptable parts with the excellent physical characteristics inherent in Kel-F, the control of temperatures, pressures, and cycles in molding are critical and should be maintained at the closest possible tolerances. The tendency is to overheat the material—running into possible danger of degradation—in order to maintain the material in a flowable state while traveling through the sprue bushing, runner, and gates.

During some of the early work with injection molding of Kel-F material, by reason of economy and experimentation, single cavity molds were used. It was noted at this time that single cavity molds appeared to produce parts with better physical properties. In a single cavity mold, the material is fed from the injection machine nozzle, through a very short sprue bushing, directly into the cavity. When multiple cavity molds were constructed for the same part, sometimes parts from the multiple cavity mold did not appear to have the same physical characteristics as those from the single cavity mold. It also appeared that the degree of control necessary with multiple cavity molds was considerably greater than that required for a single cavity mold. At that time, it was believed that if Kel-F could be maintained in a flowable state while traveling through the sprue bushing, runners, and gates in a multiple cavity mold in essentially the same manner as in a single cavity mold, better parts could be obtained.

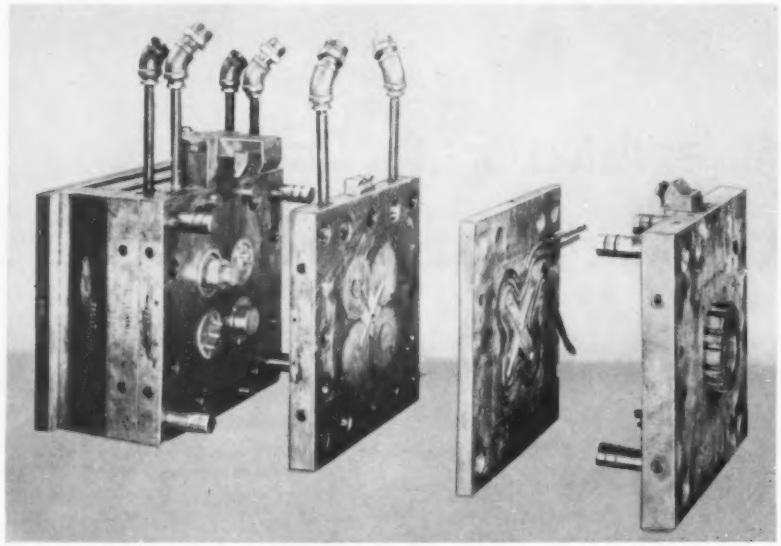


Fig. 4—Four-cavity experimental mold consists of rear half (extreme left) and front half, which in turn is comprised of front cavity plate and runner plates

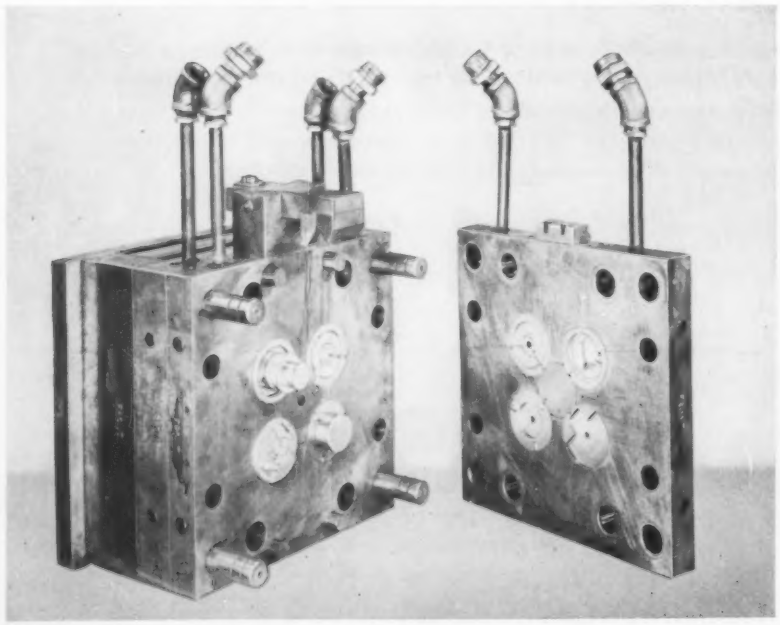


Fig. 5—Close-up view of front (right) and rear cavity plates

Laboratory Mold

Therefore, a four-cavity hot-runner laboratory mold was designed and constructed. This mold was designed to be operated as a side gated mold, as a center gated mold with a removable runner system, or as a hot-runner mold. The purpose in doing this was to determine if the physical characteristics of parts produced by a hot-runner mold could be improved over those produced in a conventional side gated or three plate mold.

Since this mold was designed to operate with three different types of gating, the length of gate on the parts produced in the hot-runner mold is by necessity somewhat longer than desirable. If a mold were being specifically designed for hot-runner operation for a particular part, this length could be reduced considerably. Figure 3 is a schematic drawing showing the design of this hot-runner mold and Figs. 4 through 7 show the design of the hot-runner system used in the laboratory mold.

With the use of a hot-runner mold, the material traveling through the cylinder and nozzle, into the sprue bushing and through a system of runners and gates, can be maintained at a temperature which is substantially above the flowable temperature of the plastic material. This would have the effect of converting the nozzle of the press and extending it to 2, 3, 4, or as many nozzles as required. This would allow the material to remain in the flowable state up to a point which would be the entrance to the cavity. Therefore, the material would be



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PHYSICAL PROPERTIES

Molecular Weight	342.38
Specific Gravity at 20/20°C	1.1271
Boiling Point at 5mm. Hg	234°C.
Vapor Pressure at 200°C	1.2 mm. Hg
Viscosity at 20°C	227 cps.
Freezing Point, sets to a glass below	−45°C.
Solubility in Water at 20°C	0.01% by wt.
Solubility of Water in at 20°C	0.56% by wt.

COMPATIBILITY

Resin	Ratio of Resin to FLEXOL 77-G 4—1	1—1
Polyvinyl Chloride	C	C
Polyvinyl Acetate	C	C
Polyvinyl Butyral	C	C
Nitrocellulose	C	C
Cellulose Acetate	C	I
Cellulose Acetate Butyrate *(37% butyryl)*	C	C
Ethyl Cellulose	C	C
Methyl Methacrylate Polymer	C	C
Polystyrene	C	C
Chlorinated Rubber	C	C

I = Incompatible *C = Compatible*

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traveling from the nozzle, into the cavity, with a minimum drop in temperature.

This type of operation has many advantages:

1) The hot-runner system is designed to effectively contain the same weight of material as required in the molded pieces. This means that the injection cylinder acts as a pre-conditioner to gradually bring the material up to a temperature which will render the material flowable without excessive degradation. The final rendering of flowability is then done in a hot-runner system just prior to injection into the cavities. Since the material is in the hot-runner system for a relatively short time, a slightly higher final conditioning temperature is generally used.

2) For the hot-runner system, the scrap resulting from sprues, runners, and gates is reduced to a minimum. The sprues and runners are not removed from the mold during each shot; only the molded parts with very small gates attached are removed. This means that Kel-F can be used to mold small parts.

3) With the hot-runner mold, 100% virgin material is used. Since with this procedure there are no sprues and runners to remove, the molder has no problem in providing storage space or in risking contamination by re-using the material.

4) Higher quality, less orientation, and higher molecular weight parts with the optimum physical properties of Kel-F are produced by use of a hot-runner mold.

Mold Design

The mold design shown in Fig. 3 and Figs. 4 through 7 is offered as a suggestion only; there are many other types of designs possible.

The cavity plate is separated from the runner plate during the open period of each cycle in order to minimize transfer of heat from the hot-runner plate. The hot-runner plate is normally operated at a temperature of approximately 525°F., the cavity plates being maintained at about 300° F., and the injection cylinder at 525 to 540° F.

When the four cavity experimental mold is used as a hot-runner system, the gate diameters are 0.062, 0.090, and 0.125 inch. It is found in general that the larger gate produces the best pieces with minimum orientation and highest molecular weight.

In parts molded in a side gated mold, the ZST[2] value dropped from virgin material with ZST of about 510 sec. to a ZST of about 170 sec. in the fabricated part. With the hot-runner mold, it was possible to take the same molding powder with a virgin material ZST of about 500 sec. and produce parts with finished ZST values of from 270 to 310 seconds.

In addition to this, it was found that through the use of a hot-runner mold system, a variation in temperature conditions on the injection cylinder has a lesser effect upon the quality of the molded parts than with a side gated mold. It was also found that cycle times could be decreased by about 15 to 30%, and production upped accordingly.

[2] ZST, a registered trademark of The M. W. Kellogg Co., refers to the zero strength time test described in detail on pp. 146 *ff* of this issue.

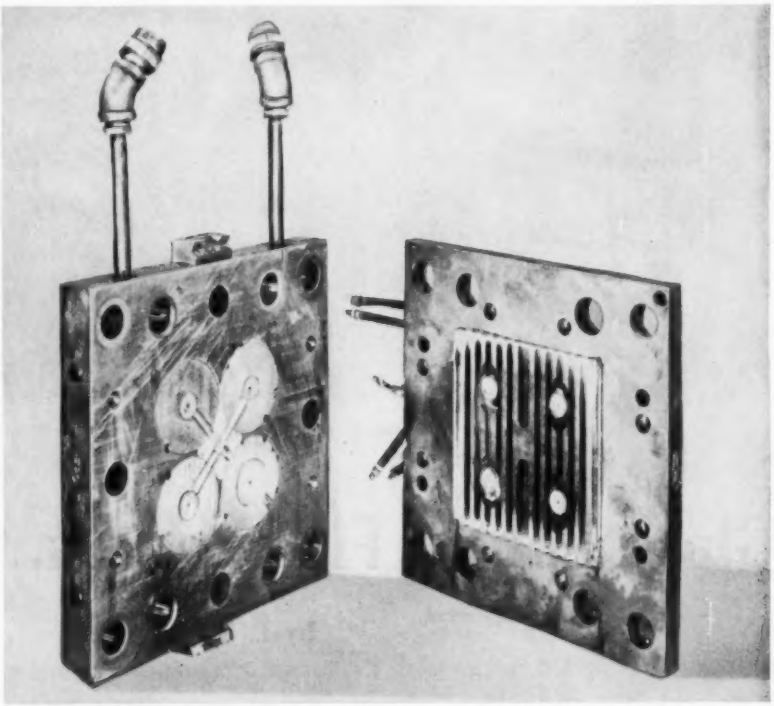


Fig. 6—Close-up view of mold plates, showing cavity and feed bushings

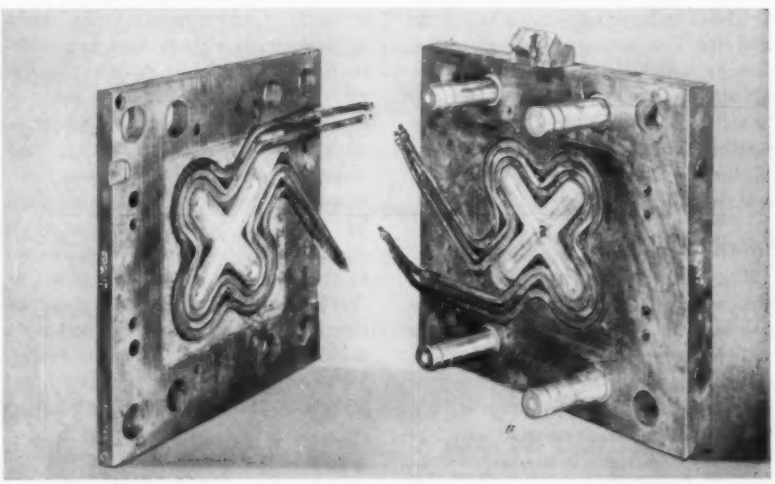
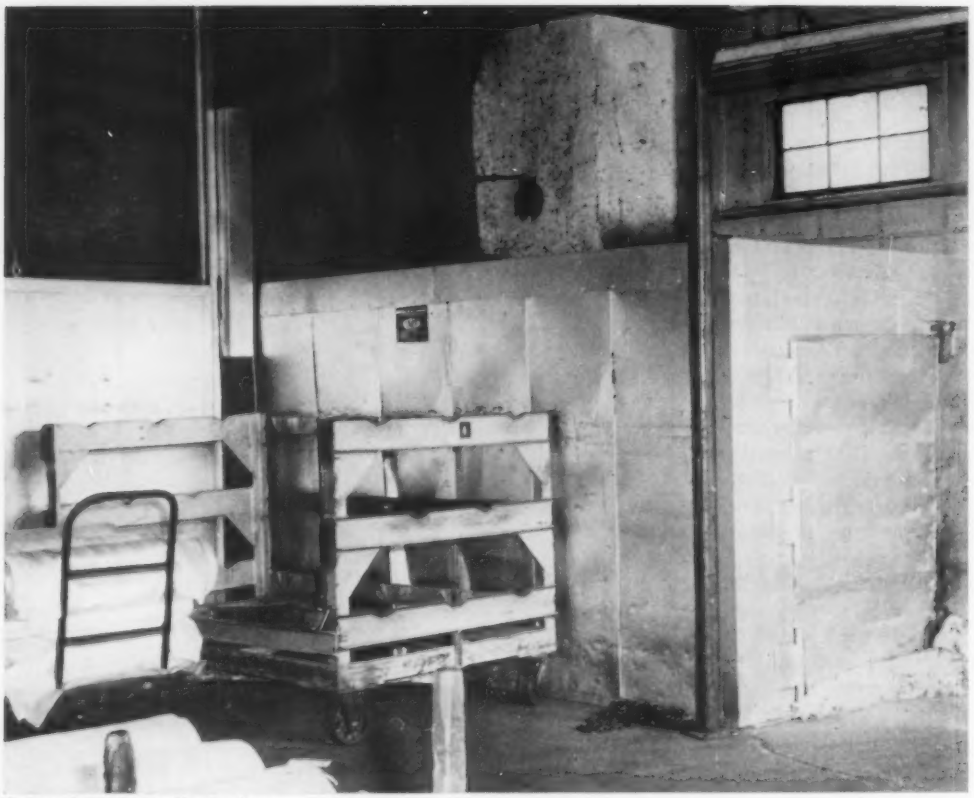


Fig. 7—Heater and hot runner plates of four-cavity, hot-runner experimental mold



Courtesy Owens-Corning Fiberglas Corp.

Heat-cleaning oven (right) is used to remove sizing from glass cloth (left, on truck) before resin impregnation

Glass Fabric Finishes Vs. Fiber Sizings*

by L. M. Calhoun†

THERE appears to be a tendency in the fibrous glass reinforced plastics industry to compare fabric finishes with sizings as applied to rovings. The primary purpose of the present article is to differentiate between the two. However, for the benefit of some who may not be familiar with the various types of finishes that are available, a brief review will be given first.

Fabric Finishes

The glass yarns from which fabrics are woven must be made as flexible and resistant to abrasion as is practical so that they will withstand the twisting and weaving operations without appreciable damage. These properties are obtained by the addition of a sizing to the fibers at the time they are formed. Unfortunately, the only suitable yarn sizings that are commercially available today contain starch and lubricants and are not compatible with molding and laminating resins; consequently, the sizing must be removed before resin impregnation. This is accomplished by heat or a combination of a chemical treatment and heat, known in the industry as *heat cleaning* or *#112 treatment*. Fabrics are sometimes used in this heat cleaned state with epoxy and silicone resins. However, most resins will not bond tightly to the bare fibrous glass and it is obvious that the strength of a laminate is dependent to a great extent on the resin-to-glass bond.

Resins are generally organic in nature while fibrous glass is inorganic; consequently, an intermediate substance that has both organic and inorganic properties must be added if a satisfactory bond is to be attained. This intermediate bond is supplied by applying various types of finishes. These finishes were primarily developed to improve the wet strength characteristics of laminates, but they also increase the speed and thoroughness of wetting out. Hence they result in a higher dry strength by bringing the impregnating resin and glass into intimate contact, thereby producing a better bond.

The commercially available finishes to date can be broken down into two general classifications: 1) chrome or Volan, 2) silane. Volan is the Du Pont tradename for methacrylate chromic chloride

* Sizing is a term used in the textile industry to designate a mixture that is used to coat the warp threads to enable them to withstand the strain of weaving. Manufacturers of fibrous glass also refer to it as a binder.

† Manager, Fiber Glass Div., Bigelow Fiber Glass Products.

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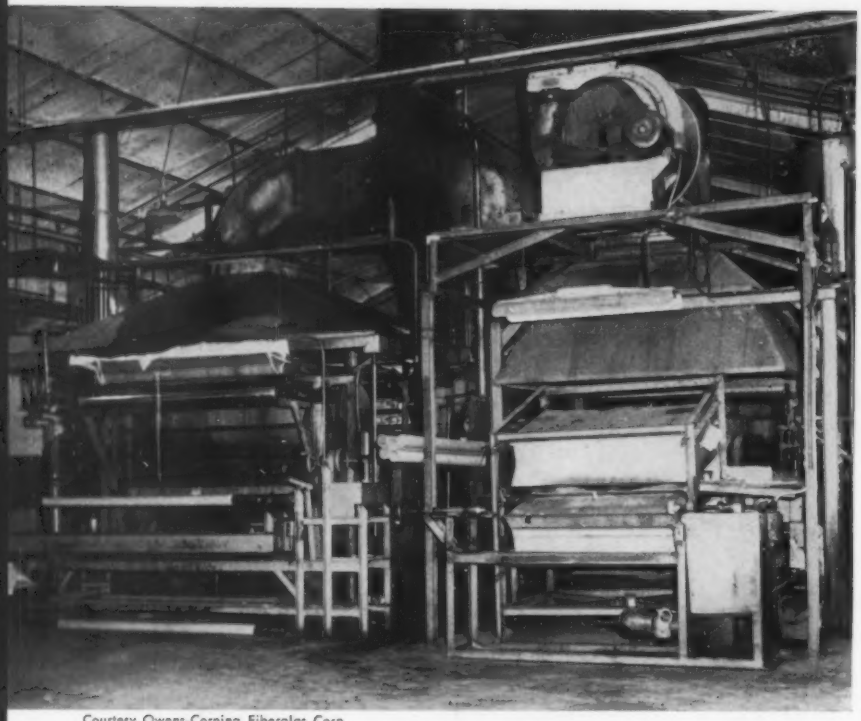
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Courtesy Owens-Corning Fiberglas Corp.

Equipment used for applying finish to glass fabric; the material is first carried through a finishing solution, then over heated rolls where finish is cured

and is the basic ingredient for the *114* and *Volan "A"* finishes. The 114 finish, first commercially available to the industry, was the forerunner of Volan "A", which is applied under better controlled conditions and is considered to be superior in every respect. The silane finishes are available under various tradenames and numbers. All of the finishes are applied to heat cleaned fabrics in an entirely separate process which is usually accomplished by padding and then drying under controlled conditions. The Volan "A" finishes requires an additional rinsing and drying operation.

Fiber Sizings (Binders)

Sizing material is applied to the individual filaments of the weaving yarns as they are drawn from small glass tanks (bushings). Each bushing contains 204 small orifices, and consequently 204 filaments are drawn simultaneously. These 204 filaments are drawn together to form what is known as a sliver. The sizing material is put on a pad or roll applicator located between the bushing and a winder. The slivers are then combined in another operation to make a roving. For example, 60 strands of sliver, each composed of 204 filaments, make up one strand of a 60-end roving.

In the forming operation, the filaments are drawn out of the bushing at a rate of over 10,000 ft./minute. It is obvious, therefore, that very little control can be maintained in applying a sizing material at this high rate of production.

The sizing material, which the fibrous glass manufacturers call a binder, is applied to all continuous filament fibers by a similar process, but the formulation is varied according to the end use. For the weaving yarns, as has been pointed out, a sizing is applied that will give the fibers maximum flexing and abrasive resistance.

If the fibers are to be combined to make a roving for the reinforced plastics industry to use in making preforms, mats, fishing rods, etc., binders that are compatible with the resins are applied. These sizings have a resinous base which tends to impart stiffness to the filaments and consequently makes them too brittle for twisting into weaving yarns.

The fibrous sizings, like the fabric finishes, can be broken down into two major classifications: 1) chrome, 2) silane. Although the basic ingredients in the binder sizings and the fabric finishes are the same, the formulations are different. Regardless of what the fibers are to be used for, they must have a certain degree of lubrication and protection against abrasion if they are to be later handled without damage.

In reinforced plastics, the best physical results are obtained from a mat or preform when the highest degree of strand integrity is maintained. Strand integrity is a measure of the number of the 204 filaments in a strand of sliver that remain together after the roving has been cut into staple lengths. To maintain this strand integrity, a film former, such as polyvinyl acetate, must be added to the Volan or

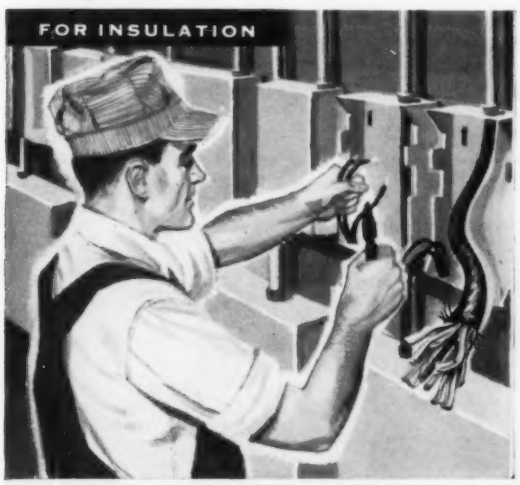
Table I—Comparison of Fabric Finishes and Fiber Sizings

	181 Glass Fabric		*Chopped Strand Mat*	
Resin Content and Properties	*114 Finish*	*Volan "A" & Silane*	*Chrome*	*Silane*
Percent of resin content	40	40	40	40
Tensile strength—p.s.i.—dry	40,000	45,000	18,000	23,000
Tensile strength—p.s.i.—2 hr. boil	30,000	43,600	9,000	16,100
Percent retention	75	97	50	70
Flexural strength—p.s.i.—dry	50,000	62,000	30,100	32,500
Flexural strength—p.s.i.—boil	37,000	59,000	14,500	21,000
Percent retention	74	95	48	65
Modulus of Flexure 10^6—p.s.i.—dry	2.40	2.60	1.14	1.19
Modulus of Flexure 10^6—p.s.i.—2 hr. boil	2.00	2.40	0.97	1.13
Percent retention	83	92	85	95

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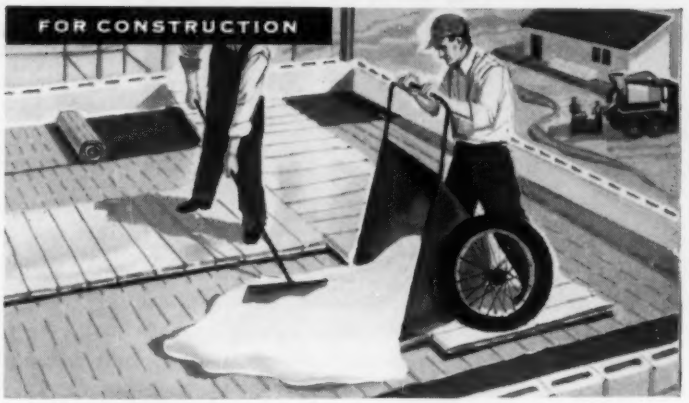


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In production of continuous filament glass yarns, 204 glass filaments are drawn from melting chamber and an organic sizing is applied as they emerge

silane. A lubricant is then added to this formulation to increase abrasion resistance. Both the film former and the lubricant tend to reduce the Volan and silane effectiveness.

Table I gives typical physical properties of laminates made from fabrics and mats with various types of finishes and fiber sizings. This clearly points out that the fiber sizings are not as effective as the fabric finishes for wet strength retention.

Woven Roving

In the past, practically all fabrics used for plastics reinforcing were woven from yarns, but recently there has been considerable interest in fabrics woven from roving.

The main difference between a roving and a yarn is that the yarn is twisted together in one or more twisting operations so as to hold the filaments together; a roving is a mass of untwisted or extremely low single twisted filaments. The twisting operation severely damages the glass filaments unless they are fully protected by a pliable binder that prevents them from abrading each other. It is, therefore, obvious why the fiber that is to be twisted into a yarn has to have a different type binder than one that is to be made into an untwisted roving.

The rovings used for weaving are practically the same as those used for mats or preforms with the exception that the strands of sliver are combined under better controlled tension. The considerable interest in fabrics woven from rovings is due to the fact that roving is cheaper than yarn, the fabrics do not require finishing, and the lack of twist gives a flatter fabric with better wetting out possibilities, especially in lighter weight rovings.

Summary

The foregoing should clearly bring out that there is a considerable difference between fiber sizing and fabric finishes. A fabric that is woven from yarns is first heat-cleaned to remove all sizing from the fibers. In a second operation the desired finish is applied to the cleaned fabric under controlled conditions. Since the third operation is to apply resin, the finish that is added is formulated to give the best molding or laminating properties and not the most protection for handling.

The fiber sizings are applied to the filament while they are traveling at a rate of speed which is so high that it does not permit close control. The fiber sizings must be formulated so as to permit further processing of the fibers, which unfortunately does not give the highest laminating or molding properties.

Volan "A", 114, 136, etc., apply to definite processes and formulations for finishes of fibrous glass fabrics and are, therefore, not applicable for sizing to fibers that are intended to go into mat roving, preforming, or weaving.

The manufacturers of fibrous glass are putting more effort and money into the development of fiber binders than into any other phase of their manufacturing process. They have a number of developments in progress that could radically change the whole picture. One of these is a fiber with a binder which will give comparable results to fabric finishes, and yet can be twisted into weaving yarns. This, of course, would eliminate the expensive fabric finishing operations.

Sixty-end roving is produced by combining sixty "140" slivers (14,000 yd./lb., 0.00040-in. diameter) from sixty forming packages; each package weighs approximately 35 pounds

Courtesy Owens-Corning Fiberglas Corp.



Drying Ink on Polyethylene Film

A discussion of experimental techniques aimed at further improvement in printing procedures

by Gene Liberty*

WHILE most printers of polyethylene film products work within the boundaries of acceptable commercial standards, tight competition has caused dissatisfaction with present achievements. The largest obstacle to better printing on polyethylene—assuming that the film has been treated adequately—is lack of a method to completely dry the ink. If printing ink can be dried more quickly and thoroughly, offset can be eliminated and printing speeds increased.

Recommendations for proper setting of inks vary with the manufacturer. Some insist on the use of cold air or a chill drum immediately before winding up the printed film. Others suggest applying the greatest amount of heat possible. A third group prescribes a combination of heat and cold: very hot air or gas flames, followed by very cold air or a chill drum prior to windup. Laboratory investigation has affirmed that all inks cannot be grouped together and treated alike.

Several methods are used to heat and cool inks on polyethylene film.

Where drying is accomplished with heat, printers generally use infra-red heaters, reflected heat, blown hot air, or open gas flames. The experimental work reported here did not prove the superiority of one system. The best results were obtained by combining blown hot air with either the open gas flame or reflected heat.

Any discussion of the drying of inks should, of course, emphasize the importance of the length of web travel. Short web travels require more intense heats.

New Theory of Ink Drying

Experimental data have led to a new theory of ink drying that seems to have considerable promise. Initial tests of the theory were favorable and results are reported here in the hope that others will be stimulated to discover its advantages.

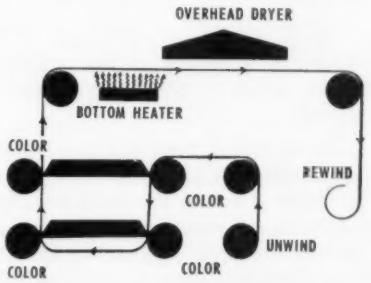
A major handicap to thorough drying of inks on polyethylene is that the film will not absorb any of the ink or allow appreciable amounts of the solvents present in the ink to pass through it and evaporate into the air. The solvent is blocked on one side by the polyethylene film and only has a single route of escape —through the ink. If that route was blocked or partly blocked, the ink would remain soft and wet for an excessive period, prolonging the drying time. This is consistent with general industry experience, and encouraged the gathering of evidence in support of what is termed the *crust theory*.

Using conventional methods of drying, it appears that before much of the solvent has a chance to evaporate the surface of the ink crusts over and becomes hardened and closed to further evaporation. Because of this crusting, the solvent is trapped between the polyethylene and the crust. A sandwich is created of polyethylene, a middle filling of wet solvent-laden ink, and a hard outer crust.

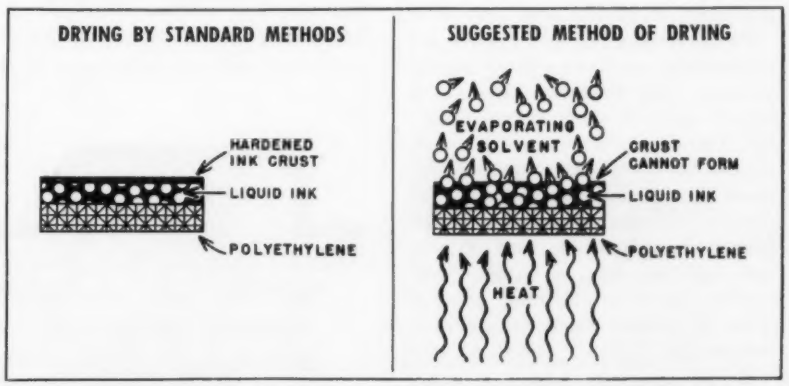
Experiments were, therefore, designed to keep the top layer of ink open and prevent formation of the crust until most of the solvent was driven off. After this was accomplished, it was anticipated that the crust would extend uniformly into the ink and not exist simply as a surface phenomenon. In effect the fluid layer would be eliminated, and all of the ink would harden.

To achieve this uniform crusting, conventional systems of ink drying had to be rejected. In most of these systems heat is applied directly to the printed surface, or where tunnels are used, hot air is blown uniformly over the top and bottom of the printed film. In this investigation, the heat was restricted to the

(*To page* 232)



Schematic diagram of a suggested set-up for printing on polyethylene film



Diagrammatic representation of ink drying on polyethylene film. Application of heat to bottom of film prevents crust formation at top of ink, facilitates solvent evaporation

* Editor, Cheslene Informational Bulletin, Chester Packaging Products Corp. This article is based on material published in that Bulletin

When and Why to Use Drape Forming

Choice of vacuum forming method depends on results desired.

Answers to questions serve as a guide

by George H. Howell*

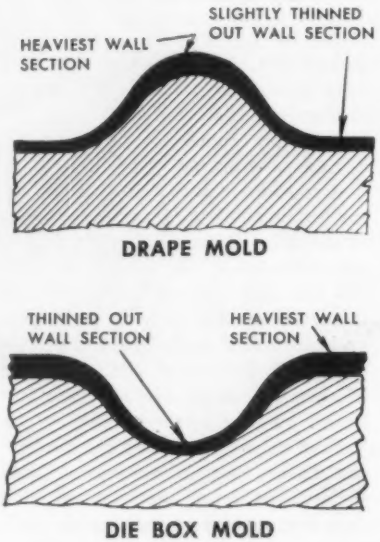
THE relatively new commercial method of drape vacuum forming makes possible the production of more articles by vacuum forming than could previously be done by the die-box method alone. Also, in many cases it is easier and simpler to form a piece by the drape method over a male or positive die than by the die-box method into a female or negative die.

It is not to be presumed, however, that drape forming is more satisfactory in all cases than the die-box forming. The two methods achieve different results in the finished piece. Each article to be formed must be considered individually, as in the following examples, and the method to be used determined by a consideration of the results which are the most important to achieve in the finished piece.

1) If the most uniform wall thickness is desired in the finished piece, which is the better method to use?

When using the die-box method and forming into a female or negative die it is possible to get a fairly uniform wall thickness by masking certain areas on the surface of the thermoplastic sheet to prevent the heat from reaching those areas. Without such selective heating, however, the die-box forming results in excessive variation in wall thickness on many pieces.

Drape forming over a male or positive die produces a more nearly uniform wall thickness because a larger area of sheet is necessary, and, therefore, there is not as much stretching or thinning out of the sheet. In addition, the technique of masking certain areas of a sheet from the heat to secure more uniform wall thickness can be equally well applied in drape forming over a male or positive die as in the die-box method.



Drape forming results in more nearly uniform wall section than obtained by die-box forming. For further details, see answer to Question 1 in the text at left

2) If close dimensional tolerances are desired on the inside wall of the finished piece, which is the better method to use?

In vacuum forming it is possible to maintain close dimensional tolerance in the formed piece on the side of the sheet that is adjacent to the die. Since the sheet follows the contours of the die exactly, the more accurate the die is made, the more accurate the formed piece will be. Due to the stretching of the plastic sheet in the forming process, the wall thickness of the finished piece will vary so that it is extremely difficult to figure what allowance is necessary for sheet thickness.

Drape forming over a male or positive die permits holding the inside dimensions to very close tolerance. Various thermoplastic materials do shrink varying amounts after forming, but the amount of shrinkage of the particular material being used can be calculated and allowed for in the die construction. (There is also some variation in the shrinkage of the dies of various die-making materials that must be allowed for.)

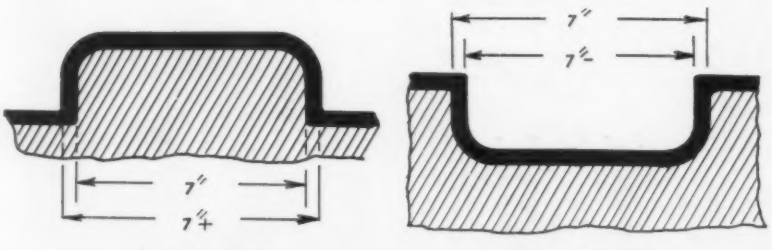
Die-box forming into a female or negative die requires taking into consideration the varying thicknesses of the drawn material, which is not practical for very close and accurate dimensions.

3) If close dimensional tolerances are desired on the outside wall of the finished piece, which is the better method to use?

By the same reasoning as in 2), die-box forming into a female or negative die permits holding the outside dimensions to very close tolerances.

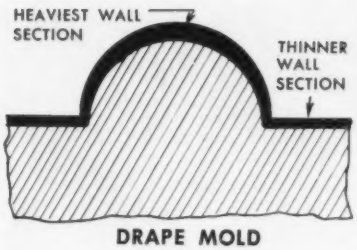
Drape forming over a male or positive die requires taking into consideration the drawn material which would be of varying thicknesses.

4) If the heaviest wall thickness is desired in the central part of the

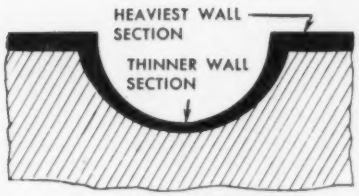


Choice of forming method, when close dimensional tolerances are to be held, depends whether inside or outside walls are involved. See answers to Questions 2 and 3 above

* Sales Engineer, Formvac Corp.



DRAPE MOLD



DIE BOX MOLD

Location of heaviest wall section in a vacuum formed piece may determine the forming method which is to be used. See the answers to questions 4 (opposite page) and 5, below

Table I—Comparative Results of Vacuum Forming With Female and Male Dies

	Female or Negative Die in Die-Box	*Male or Positive Die using Drape*
Size of original sheet in inches	7½ by 7½	11 by 11
Area of original sheet in inches	56.25	121.
Area available for forming in sq. in.	38.5	121.
Total area to be formed in sq. in.	192.	192.
Thickness of original sheet in inches	0.025	0.012
Thickness of formed piece in inches	0.005	0.005
Times sheet had to stretch to cover cylinder	5	2.3
Thickness of waste material in inches	0.025	0.005
Total amount of material used in cubic inches	1.406	1.452
Total amount of waste in cubic inches	0.444	0.413

finished piece, which is the better method to use?

Drape forming over a male or positive die without masking the heat from the surface area of the thermoplastic sheet, to secure a more uniform wall thickness, results in a heavier wall thickness in the central area since that portion of the sheet is drawn or stretched the least.

5) If the heaviest wall thickness is desired at the edges of the finished piece, which is the better method to use?

Die-box forming into a female or negative die, without masking for uniformity, gives the greatest stretch or drawing in the central area of the sheet and the least around the edges, giving a heavier wall thickness around the edges.

6) If the finest detail possible is desired on the outside surface of the finished piece, which is the better method to use?

In die-box forming into a female or negative die, the outside of the thermoplastic sheet is against the mold and the finest detail results on that surface.

7) If the finest detail possible is desired on the inside surface of the finished piece, which is the better method to use?

Drape forming over a male or positive die places the inside of the sheet against the die and gives the finest detail on the inside of the finished piece. When using thin material, detail on either side of the sheet is good and may be sufficient for most applications. With heavier sheets it is possible to secure fine detail only on one side. Many applications for the heavier sheets do not require fine detail, in which case the method used would depend upon the other results required.

8) If forming pre-printed sheets for close registration, which is the better method to use?

Drape forming over a male or positive die stretches the sheet less than die-box forming, and therefore requires less distortion in the printing. In this application, drape forming can usually be done with less difficulty.

Where exact registration is required around the edges of the formed piece, the die-box method would be preferred as there is less stretch of the sheet in that area.

9) If forming transparent metallized sheet material, which is the better method to use?

The Gomar Manufacturing Co., Newark, N. J., manufacturers of metallized sheet material, have this to say about the method to use with this type of material:

"It has, in general, been found necessary with metallized butyrate to work with male molds because it is essential that the uncoated or plastic side be the outside after molding."

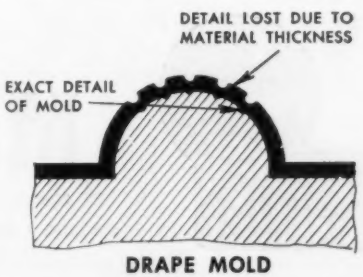
This stands to reason, for the coated side of metallized sheets cannot stand weathering as well as can the uncoated or plastic side. The plastic side thus serves as a protection for the metallized coating.

There are instances where it is desirable that a printed or inked side of the sheet be placed against the die. There are also instances where the printed or inked side cannot be placed against the die.

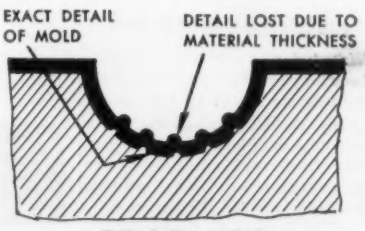
10) What is the difference in operation costs between the two methods?

An inherent disadvantage of vacuum forming is the lack of uniform-

(*To page* 233)



DRAPE MOLD



DIE BOX MOLD

Illustrations courtesy Formvac Corp.

In general, finest detail in vacuum formed sheet is obtained on the side of the sheet against the mold. Selection of method to be used is discussed in answers to Questions 6 and 7



Matched phenolic dies for metal forming of aircraft parts, cast from Marblette resin #78, accurately conform to the original blueprint details.



Large metal parts like this aluminum gas tank are hydroformed on dies of dimensionally stable resin #78.



Lay-up molds of resin #78 are utilized to produce polyester-impregnated fibrecloth wing tips by the bag molding process.



Pattern duplicates for mass-production latex dipping are made from phenolic resin #71 to slim down girdle manufacturing costs.

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Structural Laminates From Epoxy Resins†

by D. W. Elam‡ and F. C. Hopper‡

The Epon[1] resins are well known today for their use in surface coatings. They are also known for their good adhesion and for their use in adhesives. These resins can, in addition, be used for making glass fiber laminates with unusually attractive properties. A description of such laminates together with a summary of how to prepare them is presented in this paper.

GOOD adhesion to glass fiber is a characteristic of Epon resins. This is evident to anyone who cuts at the corner of such a laminate with a knife, as illustrated in Fig. 1. It is difficult to separate the plies of a properly prepared laminate. A better illustration of good interlaminar bonding is given in Fig. 2, which is a photograph of some compressive test specimens after failure. Specimens *a* and *b*, which are 181 glass fabric-Epon laminates, show 100% shear failure with no delamination. Specimen c, which was made with another resin, illustrates failure by delamination. As is implied by these pictures, the compressive strength of Epon laminates is high.



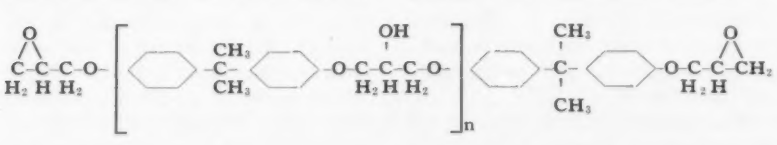
Fig. 1—Knife delamination test on laminate made of glass cloth and Epon resin



Fig. 2—Failures of glass fabric laminates tested in compression; *a* and *b* are Epon resins, *c* is another resin

Basic Chemistry

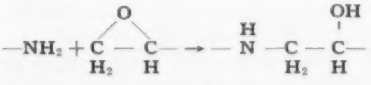
The Epon resins belong to the class of laminating resins that cure by addition polymerization, without formation of volatile or other by-products. Thus they are workable at low laminating pressures. An idealized formula for the base resin is



where the value of n is near zero for the liquid grade Epon 828, and has a value averaging between 2 and 3 for the solid grade Epon 1001.

The epoxide rings which lie at the two ends of the molecule are the active groups through which cure is accomplished. To a very minor extent, the hydroxyl groups may participate in the cure of the laminating formulas.

The curing process is based largely on the addition of an amino group to the epoxide group, as follows:



If the amine molecule contains more than one amino group, two or more epoxide units may be coupled together. The maximum amount of coupling, or the best cure, will occur when the epoxide and amino groups react without any of either being left in excess after reaction is finished. For this reason the amount of curing agent used in Epon resins must be carefully controlled. The recommended practice is to weigh the curing agent to within ± 10% of the designated amount.

The Epon resins and the amine curing agents are by themselves stable compounds and will keep almost indefinitely under room conditions. As soon as they are mixed, however, the curing process usually begins, even at room temperature. For this reason the pot life of these systems is generally short.

We have, in our research labora-

* Reg. U. S. Pat. Off.

† Presented at the Pacific Coast S.P.I. Meeting, Coronado, California, 1954. Most of the work reported here was sponsored by the Materials Laboratory, Directorate of Research, Wright Air Development Center, USAF, Contract No. AF 33(038)-19587.

‡ Shell Development Co.

[1] Tradename of Shell Chemical Corp.

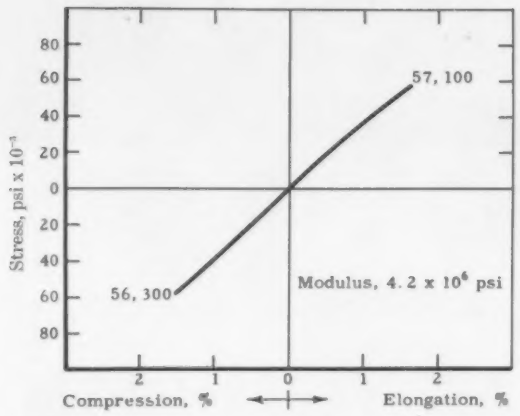


Fig. 3—Stress-strain curve in tension and compression for a 181 glass fabric-Epon 828 laminate, cured with curing agent A

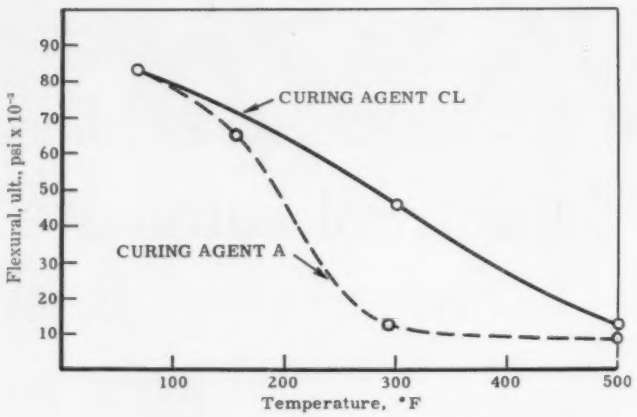


Fig. 4—Effect of temperature on the flexural strength of glass fabric laminates made with Epon 828, cured with two different curing agents

tories, examined a large number of laminating formulas, based on the various grades of resin and based on different curing agents. Of these, four have been selected for description here, each one representing the best choice from the formulas in its class. These four can be divided first of all according to the technique of laminating: the wet lay up process, and the dry sheet process.

Wet Laminating Process

The two formulas that are recommended for wet laminating are: a) Epon 828 plus 8 p.h.r.[2] curing agent A (diethylaminopropylamine), which system we shall designate as 828/A; and b) Epon 828 plus 14 p.h.r. curing agent CL (*m*-phenylenediamine), which formula[3] we shall call 828/CL.

The curing agent A is a thin liquid which is easily stirred into Epon 828, and the viscosity of this mixture is 4500 cp. at room temperature. The viscosity will, under ordinary conditions, rise to 100,000 cp. in about 3½ hours. At this viscosity the resin is becoming too thick to use in hand lay-up assemblies. If a thinner resin is desired, warming to about 120°F. will drop the initial viscosity of the mixture to 720 cp. and the useful life of the resin at this temperature is about 2 hours. The viscosity may also be reduced by about one-half with the addition of about 2% xylene. This quantity of diluent can be tolerated without apparent degradation of the room temperature laminate strength. Epon 828 resin, when mixed with curing agent, is used for fabricating laminates in a manner similar to that for any other wet laminating, 100% reactive resin.

The recommended cure for the 828/A system is 30 min. at 240°F. For the mass production of molded pieces, a shorter higher temperature cure could probably be worked out. In the laboratory preparation of 8- by 8-in., 12-ply test panels, the laminate is heated for 1 min. under contact pressure, then for the balance of the cure period at 25 p.s.i. Without the precure at contact pressure, the resin flow is excessive and a starved panel is obtained.

The mechanical properties of 828/A laminates, represented by a compressive-tensile stress/strain diagram, are shown in Fig. 3. These data were obtained on laminates made with 12 plies of 181 satin weave fabric. The resin content was 26 percent. Figure 3 reveals the following data on ultimate strengths: tensile strength 57,100 p.s.i., compressive strength 56,300 p.s.i., modulus at 0.2% offset 4.2×10^6 p.s.i.

The influence of temperature on the strength of 828/A laminates is shown by the broken line in Fig. 4, which is a graph of the flexural strength over a range of temperature measured on the same type laminate represented in Fig. 3. The high strength of these laminates is maintained roughly up to a temperature of about 160°F.

For applications in which strength is needed at temperatures above 160°F., the 828/CL system is available. The solid line in Fig. 4 shows the flexural strength over a range of temperature for 828/CL laminates.

Curing agent CL is a solid. It melts at a little below 150°F. In order to dissolve it in the resin, it is recommended that both the resin and CL be heated to 150°F. and that the two liquids then be stirred together. At this temperature the catalyzed resin will have a viscosity of about 200 cp., and the useful life of the mixture for pouring and handling is about 50 minutes.

Epon 828/CL laminates of ⅛ in. thickness may be cured in 15 to 30 min. at 240°F. Postcuring at 400°F. substantially improves strength at elevated temperatures. Figure 4 represents a laminate that was postcured at 400°F. for 1 hour.

The 828/CL system, if allowed to stand at room temperature, will convert to a solid in 16 to 24 hours. The solid is soluble in ketone solvents and is, therefore, also fusible. Cloth that is impregnated with this solid form may be laminated at 200 p.s.i. using the same temperature schedule recommended above. This system continues to cure at room temperature, but usually remains fusible for 2 or 3 weeks. Under refrigeration this period may be prolonged.

Although the 828/CL system is somewhat more difficult to handle than 828/A (principally due to viscosity), the properties of the laminate are superior. A typical stress/strain curve of an 828/CL laminate in compression and tension is shown in Fig. 5, p. 143. The data are based on a laminate from 12 plies of 181 cloth made at about 30% resin content. The ultimate strengths obtained are:

[2] p.h.r. signifies parts per hundred resin, by weight.
[3] Patent applied for.

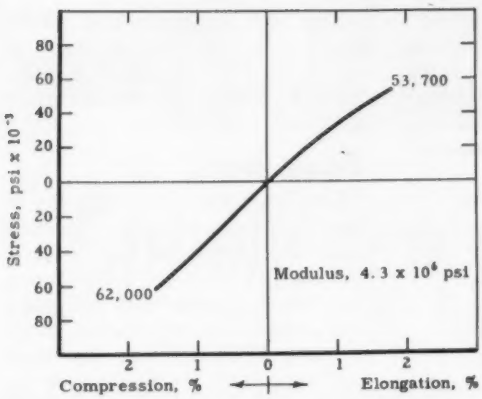
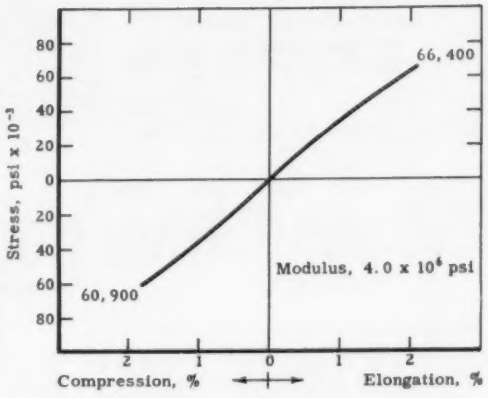


Fig. 5 (left)—Stress-strain curve in tension and compression for a 181-weave glass fabric laminate which contains Epon 828 and was cured with curing agent A

Fig. 6 (right)—Stress-strain curve in tension and compression for a 181-weave glass fabric laminate which contains Epon 1001 and was cured with dicyandiamide



tensile strength 53,700 p.s.i., compressive strength 62,000 p.s.i., modulus at 0.2% offset 4.3×10^6 p.s.i.

Dry Laminating Process

There are two systems (in addition to dry 828/CL) that we wish to recommend for dry lay-up laminating. These are based on a) Epon 1001 plus 4 p.h.r. dicyandiamide, which we shall call 1001/dicy, and b) 1 part Epon 1001, plus 2 parts Plyophen 5023[4], plus 4 p.h.r. dicyandiamide. This second system we shall call 1001/5023.

Epon 1001 is a solid resin which melts in the neighborhood of 160°F. and is readily soluble in ketone solvents. An impregnated fabric or mat may be prepared from this resin by first dissolving the Epon 1001 and the 4 p.h.r. dicyandiamide in a ketone[5]. The cloth is then immersed in this solution and dried. The result is a perfectly dry, somewhat boardy laminating stock which has almost indefinite storage life at room temperature. Conditions of impregnating should be chosen to accomplish a loading of about 30 to 32% resin on woven cloth.

To prepare a laminate the desired number of plies are stacked and heated under mild pressure. In preparing 12-ply test panels in the laboratory, the cure conditions are 30 min. at 345°F. The first 5 min. are used to heat and thus secure the resin, after which 25 p.s.i. pressure is applied for the remaining 25 minutes.

The advantage of this laminating system is that, while being a low-pressure technique, it can be handled dry in the uncured state. This permits precutting to shape if desired. The 1001/dicy mixture is apparently stable for an indefinite time at room temperature. The impregnated cloth may be used as a tape adhesive also.

The mechanical strength at room temperature of 1001/dicy laminates is shown in Fig. 6. Again, the data were obtained on a 181 fabric laminate with about 30% resin content. The ultimate strength values represented in Fig. 6 are: tensile strength 66,400 p.s.i., compressive strength 60,900 p.s.i., modulus at 0.2% offset 4.0×10^6 p.s.i.

Although the properties of 1001/dicy laminates are good at room temperature and up to 160°F., the strength deteriorates at still higher temperatures, as seen by the broken line in Fig. 7, which shows the ultimate flexural strength at temperatures up to 500°F. These data are also based on 181 fabric laminates.

A considerable portion of our recent work in Epon laminating has been devoted to improving the high-temperature strengths. One accomplishment of this work is shown by the solid line in Fig. 7. The resin system that exhibits this good strength at high temperatures is

[4] Tradename of Reichhold Chemicals Co.

[5] The dicyandiamide will not dissolve directly in the ketone. It may be dissolved readily, however, in boiling 60/40 acetone/water. This solution can then be added to the resin solution.

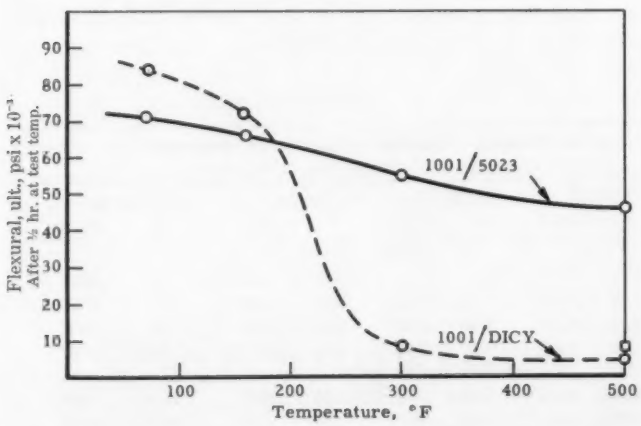


Fig. 7—Effect of temperature on flexural strength of glass fabric laminates based on Epon 1001/Plyophen 5023 and Epon 1001/dicyandiamide

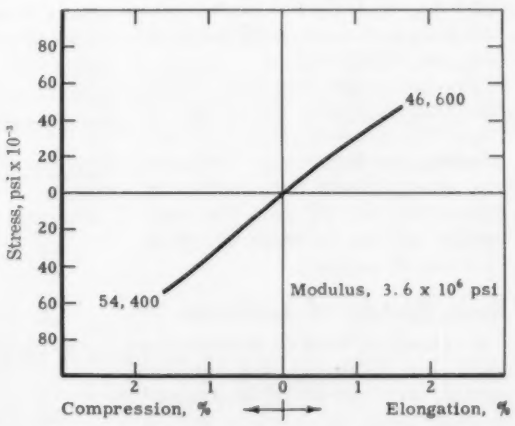


Fig. 8—Tensile strength, compressive strength, and modulus of elasticity of Epon 1001/Plyophen 5023-glass fabric laminates

Table I—Flexural Strength of Epon Laminates

Condition	Flexural Strength 828/A	828/CL	1001/ dicy	1001/ 5023
	p.s.i.	p.s.i.	p.s.i.	p.s.i.
Dry	82,700	83,000	81,700	73,900
30 days in water	74,100	80,000	76,000	73,400

1001/5023. The symbol □ shows the residual strength at 500°F. after 200 hr. aging at that temperature.

The Plyophen 5023, which is a liquid phenolic resin of about 85% solids, must be used with Epon 1001 in laminating by the dry lay-up process. The two resins plus dicyandiamide are dissolved in a ketone and applied to a fabric, which is then dried. The phenolic component of this system is not very stable, and this results in a need for greater care during drying the cloth and for storing it after impregnation. If the impregnation is performed properly, the laminating stock should be usable after two or three weeks' storage at room temperature, or after two or three months' storage under refrigeration (40°F.).

The fabric impregnated with 1001/5023 is pliable and easily contoured. It can be easily laminated at 25 p.s.i., and there are reports of success in using bag molding at 14 p.s.i. The recommended cure for this system is 30 min. at 330°F. The best laminates in the 8- by 8-in. test panel size are made by using a 5-min. precure at contact pressure, followed by 25 p.s.i. for the balance of the cure period. This system, containing a phenolic resin, forms some water vapor during cure, and trials will therefore be necessary to determine the best preheat and breathing time.

The mechanical properties of the 1001/5023 laminates are shown in Fig. 8. The strength values are: tensile strength 46,600 p.s.i., compressive strength 54,400 p.s.i., modulus at 0.2% offset 3.6×10^6 p.s.i. The resin content of the laminate described here was 24 percent.

Resin Content of Laminates

A characteristic of the Epon resin-glass cloth laminates that helps to explain the high strengths attained is their ready preparation with a low resin content. Preliminary work on the effect of resin content showed that maximum strength was obtained in the neighborhood of 30% resin (of the total weight). Other early work on the 1001/dicy system showed only a slight variation in flexural strength through the range 26 to 34% resin.

The experimental values are:

Resin Content	Flexural Strength
%	p.s.i.
26	77,800
28	75,700
30	76,100
34	76,000

At 37% resin there was a noticeable decline in flexural strength.

Effect of Cloth Finish

The good adhesion of Epon resins to glass is another factor that contributes to the excellent strength of the laminates. This adhesion is improved, however, by the proper choice of glass finish. The adhesion is especially aided by a good finish when the laminate is to be subjected to water exposure.

Table I shows the resistance to water of the four laminating resin systems described above. Volan A finish on 181 weave cloth was used for all tests. The test specimens were cut ½ in. wide and immersed in water for 30 days. They were then tested in flexure.

The 1001/5023 laminates show good wet strength after high temperature aging. For example, after 24 hr. exposure at 500°F., some ½ in. wide test specimens were immersed in water for 24 hours. They were then tested in flexure with the following results: flexural, ultimate 40,400 p.s.i., modulus at 0.2% offset 2.9×10^6 p.s.i. We have not seen any other high temperature laminating resin that shows this type of wet strength retention.

The Epon laminates also exhibit good resistance on exposure to chemicals. This is especially true of the 828/CL system. A detailed report is available elsewhere.[6]

Release Agents

The inherently good adhesion of the Epon resins to metal presents a potential problem on the release of molded parts from the molds. In our early experimental work this was a real obstacle, and the hazard should be considered seriously by those undertaking for the first time to use these resins. There are release agents, however, which give excellent release when properly used. These are: a) Dow Corning XEC 135A, and b) Garalease by Garan Chemicals. We have also successfully used General Electric Silicones SR-53 and SR-55.

All these recommended release agents are based on silicone resins. The emulsions are spread, allowed to dry, and if necessary, rubbed down to obtain a smooth film. Solvent solutions, such as Garalease, should be spread liberally and after drying, baked for about 10 min. at a minimum temperature of 225°F. to remove the last traces of solvent.

Electrical Properties

The a.-c. electrical properties of Epon laminates have been determined on the four systems described over the range 100 cycles to 1 megacycle, as shown in Table II.

The arc resistance[7] of the three straight Epon laminates is in the range of 125 seconds.

[6] "A new Epon resin curing system for chemical resistance applications," J. E. Carey, H. Chorney, and R. L. DeHoff. Reprints of the Ninth Annual Tech. and Management Conf. S.P.I., Feb. 1954, Section 7N, p. 1. Also similar information is available in brochure, "Curing agent CL in Testing and Laminating Applications," Shell Chemical Co.

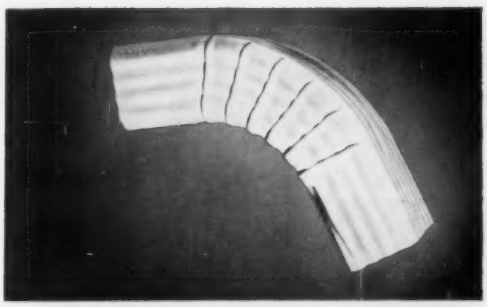
[7] ASTMD 495-48T

Table II—Electrical Properties of Epon Resin Laminates
(Dielectric constant, ε', dissipation factor, tan δ)

Frequency	828/A ε'	828/A tan δ	828/CL ε'	828/CL tan δ	1001/dicy. ε'	1001/dicy. tan δ	1001/5023 ε'	1001/5023 tan δ
cy.				DRY				
10^2	5.16	.0192	5.68	.0231	5.35	.0093	4.65	.0218
10^3	5.01	.0167	5.25	.0180	5.27	.0080	4.49	.0197
10^4	4.91	.0131	5.38	.0163	5.22	.0102	4.38	.0127
10^6	4.77	.0222	5.22	.0202	5.05	.0219	4.33	.0157
				WET (After 24 hr. in Water)				
10^2	5.26	.0292	6.03	.0526	5.44	.0213	5.69	.0866
10^3	5.08	.0195	5.66	.0347	5.35	.0106	5.10	.0784
10^4	4.96	.0141	5.44	.0213	5.27	.0108	4.76	.0331
10^6	4.82	.0226	5.23	.0211	5.12	.0226	4.51	.0213

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Determination of Apparent Molecular Weight of Polychlorotrifluoroethylene

by Herman S. Kaufman,† Charles O. Kroncke, Jr.,† and Carmen R. Giannotta*

MOLECULAR weight is one of the most important basic properties of thermoplastic high polymers because of its influence on other physical properties which in turn affect the practical use of these materials. Among the outstanding molecular weight dependent properties are crystallizability, softening point, tensile strength, elongation, and embrittlement. Since optimum behavior as to these properties occurs at high molecular weights, it is desirable to have the highest practical molecular weights in fabricated items.

It is especially important to maintain a rigorous check on the molecular weight during the fabrication of high temperature thermoplastics such as polychlorotrifluoroethylene. The fabrication temperature of the polymer approaches the temperature of thermal degradation so that there is a real danger of causing excessive degradation if care is not exercised during molding. Practically, from a production point of view, it is necessary to have a simple, rapid test for molecular weight which can be carried out as the parts are fabricated.

Until recently, there were three methods for the molecular weight grading of chlorotrifluoroethylene polymers: the no strength temperature[1] (NST), flow index,[2] and solution viscosity. The last mentioned, however, is not particularly suitable for quality control under production conditions. It is time-consuming and requires specially trained personnel and elaborate apparatus, including an analytical balance.

The remaining two methods also



Fig. 1—Specimens are prepared by first placing polymer granules on polished ferrous plate, putting second plate on top

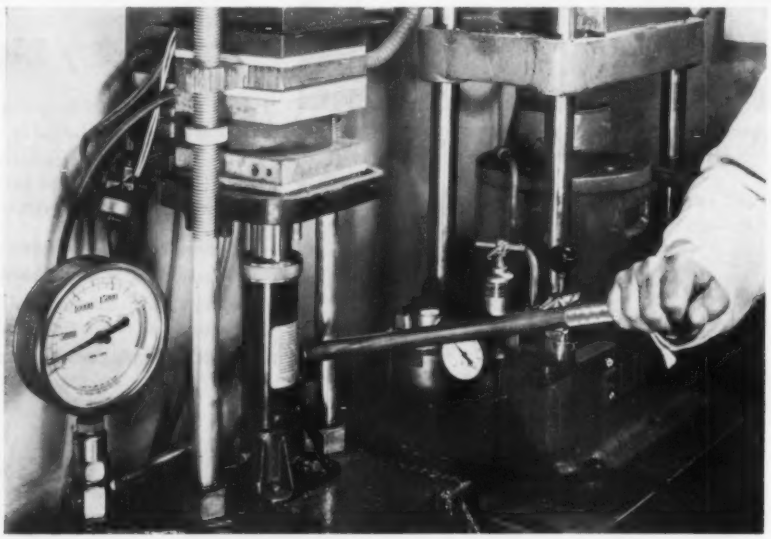
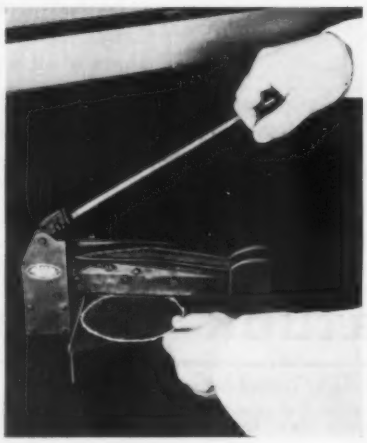


Fig. 2 (above)—The plates are next placed between platens of a press where, after preheating, the granules are formed into an amorphous sheet . . . Fig. 3 (left, below)—Formed sheet is cut into test strips and . . . Fig. 4 (right, below)—notched at centers





†Petroleum and Chemical Research Laboratory, The M. W. Kellogg Co.
* Chemical Manufacturing Div., The M. W. Kellogg Co.
[1] Kel-F Technical Bulletin 2-1-49, 2.
[2] Dexter, F. D., Modern Plastics *30*, 125 (Apr. 1953).

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have their shortcomings. Both the NST and flow index tests degrade higher molecular weight resins during measurement. The NST test is comparatively slow, especially for high molecular weight samples, and requires careful attention. The flow index test requires two separate weighings, one of which is done on an analytical balance, and careful instrument cleaning between runs. In addition, two separate extrusion dies are required for the evaluation of the complete range of commercially available polymers. In order to eliminate all of these objections, the zero strength time (ZST)[3] test and apparatus[4] were developed.

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The ZST apparatus is semi-automatic in operation, thus minimizing the need for personal attention. The

(*To page* 236)

[3] Registered trademark of The M. W. Kellogg Co.
[4] The Kellogg ZST Tester is commercially available from F. J. Mullowney Co., Trenton, N. J.

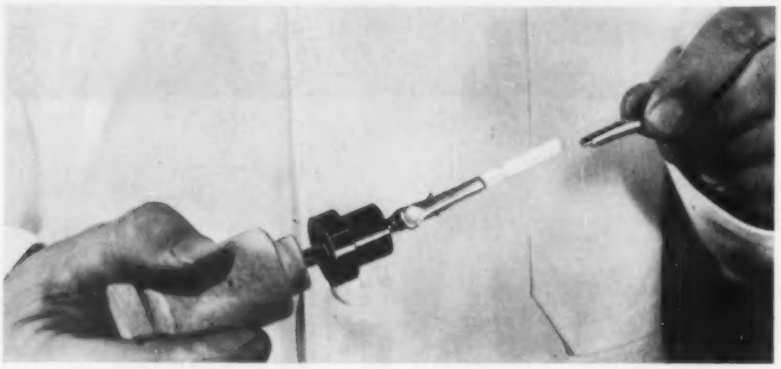
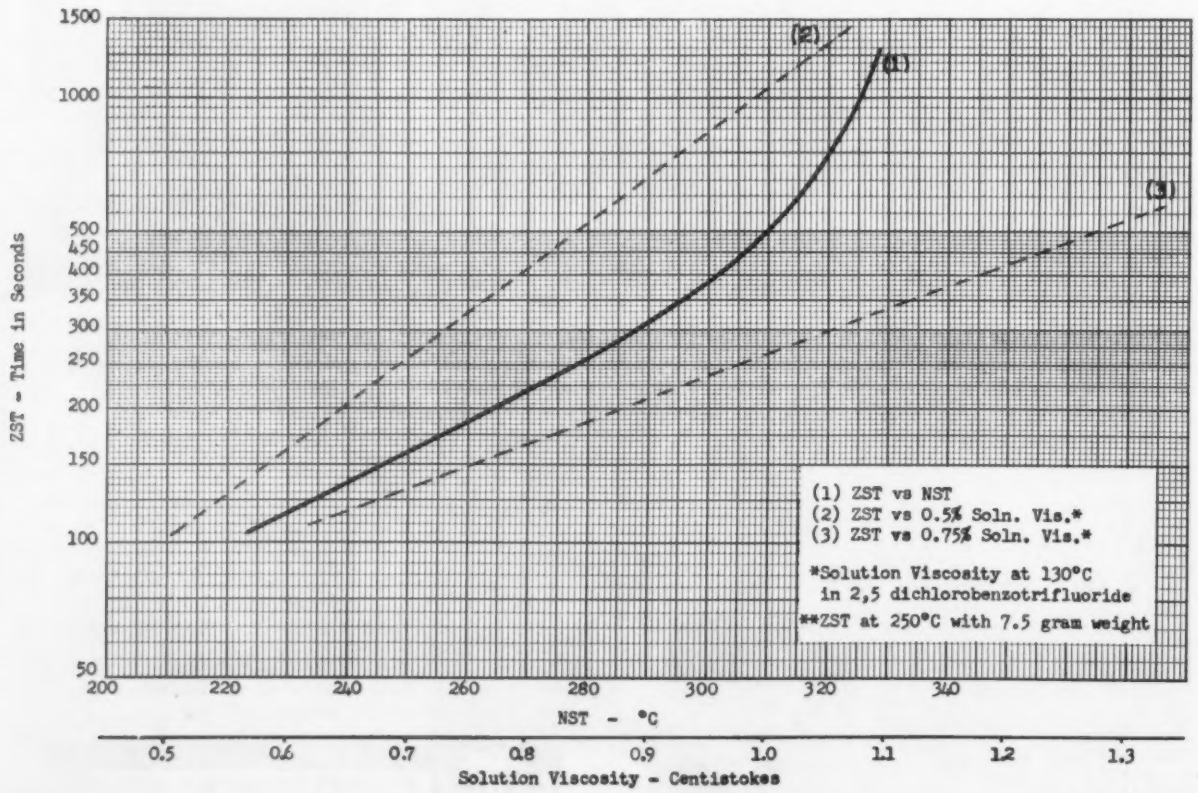


Fig. 5—One end of each notched test specimen is clipped to a specimen holder at room temperature; the other end of the specimen is clipped to a 7.5-g. weight



Fig. 6—Specimens are placed in furnace; time of breaking is recorded

Fig. 7—Semi-log curves relate ZST**, NST, and solution viscosity* values; non-linearity of curve 1 above 300 sec. is due to degradation



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Testing for Defects in Polyethylene Welds

by F. J. Bockhoff* and J. A. Neumann*

Many methods are available for testing defects in polyethylene welds, both inherent and environmental. Each of these methods has its particular advantages, but perhaps the most complete examination of a weld would be given by a combination of three tests: 1) a spark test for porosity, 2) a radiographic negative where necessary, and 3) a test for detrimental environmental effects according to the Agile test method 17-W, which is specific for each application. The availability and simplicity of these tests enable polyethylene fabricators to insure soundly constructed process equipment meeting the most rigid specifications.



Fig. 1—Large welded tank made of reinforced polyethylene sheet material

THE rapid advancement of hot gas welding techniques within the last ten years has made possible the development of many types of large and complicated plastic structures. This is particularly true in the field of polyethylene fabrication, which includes such applications as duct work, pipe fittings, tank linings, and many other types of chemical process equipment. Typical of the large structures that have been fabricated by welding is the reinforced polyethylene tank shown in Fig. 1. The tank measures 10 by 6 by 4½ ft. and involves approximately 175 ft. of welded joint, all of which must be inspected for soundness and durability. Large self-supporting reactors, such as that shown in Fig. 2, have been very successfully fabricated by the welding of sheet stock and have been found to provide excellent durability and ruggedness in commercial use.

The hot gas welding of plastics (1)[1] differs from that of metals in that complete fusion is not attained; in fact, this is actually undesirable. The method of welding, which is thoroughly discussed elsewhere (2), involves practically the same type of weld joint preparation as one would encounter in steel welding. The filler rod is composed of material identical in composition to that of the parent sheet or similar stock to be welded. In making the weld, the filler rod and surfaces to be joined are simultaneously heated with a directed blast of hot gas (nitrogen in the case of polyethylene), which melts only the surfaces to be bonded. Under these conditions, the weld bead is laid with hand pressure and allowed to cool. It has been found that in butt welding of sheet stock, the tensile strength of the weld is from 85 to 95% of the sheet itself, although in some cases weld values of over 100% have been observed, even though the weld had been dressed previous to testing. These figures, of course, only apply to welds made by experienced welders; it has been found that good welds are largely dependent upon the skill and training of the operator. For example, weld strength values of from 60 to 75% are not uncommon for inexperienced workers. Experience acquaints one with the possible weld defects due to poor technique and allows him to eliminate them completely after a period of time.

Physical Defects

Although faulty welds may result from defective filler rod (for example, rod containing air inclusions), the fault generally lies in poor or careless technique. The best welders, however, are not flawless and defects occasionally occur. These defects may be caused by several factors. Insufficient fusion due to an excessively low operating temperature or too high a linear welding rate may lead to poor bonding. Air may be included in the weld if the filler rod is laid carelessly. This, of course, appreciably detracts from the weld strength at that point and may lead to eventual leakage under field conditions. Failure to completely fill an undercut may produce a weld that appears to be sound upon external observation but can actually be quite defective. It is essential that one be able to ascertain these defects before any welded piece is put to use.

Perhaps the simplest method for detecting poor bonding is to allow a 6- or 8-in. section of filler rod to extend beyond the weld proper. After the weld has cooled completely, any attempt to pull off the filler rod should result in a tear at the end of the weld; a poorly made weld will allow the rod to be pulled out of its

(*To page* 154)



Fig. 2—Reactor which has been completely fabricated of polyethylene

* American Agile Corp.

[1] Numbers in parentheses link to references at end of article.



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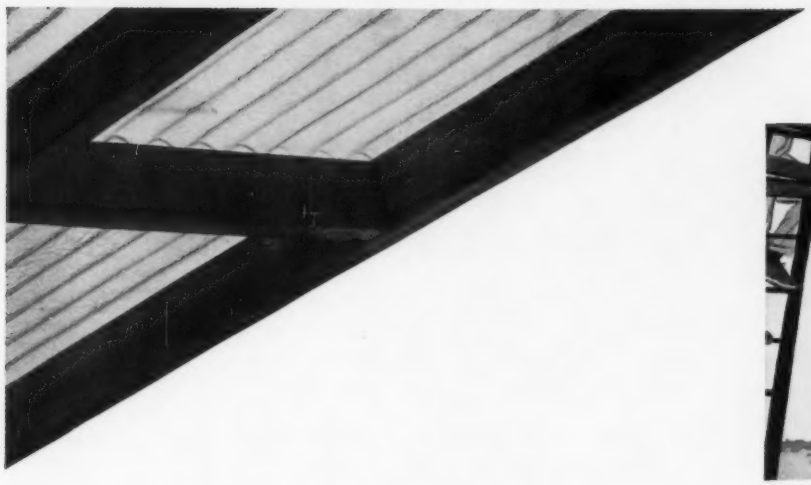
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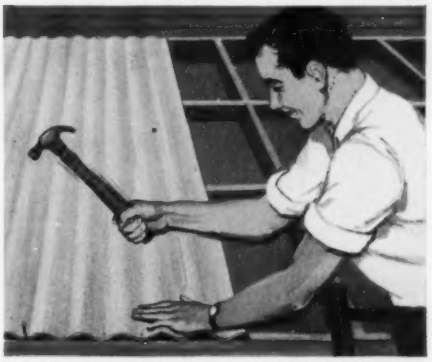


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Fig. 3—Porosity test is conducted by use of a 30,000-v. spark coil



Fig. 4—Radiograph of 2-in. polyethylene Y-valve. Arrows indicate failure to attain complete weld penetration

bed. In using this method, however, one might easily miss air inclusions or cracks in localized sections of the welded joint.

An ordinary inspection light held at oblique angles to the weld shows air inclusions remarkably well, provided, of course, the polyethylene is not pigmented. The method is, therefore, unsatisfactory for use with black outdoor-grade polyethylene.

An excellent method for detecting minute pores and cracks involves the use of a high-frequency, high-voltage spark coil tester such as that shown in Fig. 3. This method is particularly useful for examination of tank liner welds, since the steel supporting tank serves as a particularly good electrical ground. In making the actual test, the tip of the coil is run along the welded joint; if porosity is present, a spark will readily appear. The voltage rating of the coil may vary between 15,000 and 60,000 v., depending upon the thickness of the liner and the magnitude of the porosity to be detected, although 30,000 v. is a good figure for general usage. In those installations in which a metallic backing is not present, such as lined wooden tanks, a ground must be provided. This can be done by painting the non-conducting material, such as the wood, with a conducting paint, or by using a metal foil backing for testing purposes. In testing some intricate types of construction it is often advisable to fill the interior with mercury and make the test from the outside. This method is, of course, limited in size of unit to be inspected.

A relatively simple way to test small enclosable structures is to apply air pressure to the inside and submerge in water. Any leaks of reasonable size can be readily detected by the bubbling of the escaping air at these points. Fine porosity may, however, escape notice completely when using this method.

A similar method for leak detection which has received some use in previous years involves painting a soapy solution on the exterior welds of a pressurized vessel. Leaking air causes soap bubbles to form, thus locating the defect. This method is, however, definitely to be frowned upon when testing polyethylene, since the surface-active soap is an environment that can promote stress cracking. This will be discussed more thoroughly later.

Perhaps the most efficient method for locating defects in plastic welds is radiography (3), or X-ray photography. The radiograph of a defectively welded polyethylene valve is shown in Fig. 4. Failure to achieve complete penetration is readily evident. This type of defect would most likely not be detected by any of the previously mentioned methods. Radiography, in addition to providing excellent detail, gives a complete visual picture of the welded joint and provides a permanent record. The disadvantage of radiography lies in the expense involved in checking a welded structure of any appreciable size. Nevertheless, this expense may be warranted when handling particularly dangerous chemical materials, where weld failure would be disastrous. Fluoroscopic methods of X-ray testing, although excellent for the detection of defects of larger size, are generally unsatisfactory for detailed weld examination.

Environmental Weld Failures

In the presence of certain active environments, polyethylene welds are known to undergo embrittlement which very frequently leads to complete failure of the weld (4), such as that shown in Fig. 5. This is particularly true in those applications in which the weld is under stress, such as corner welds in tank linings of the type shown in Fig. 6. Butt welds in cylindrical tank lining joints such as shown in Fig. 7, p. 240, are, however, comparatively free from this type of attack since the stresses caused by differential thermal ex-

(*To page* 240)



Fig. 5—Results of stress cracking in welded corner of ⅛-in. tank liner



Fig. 6—Polyethylene liner, fabricated of ⅛-in. sheet, is installed in tank

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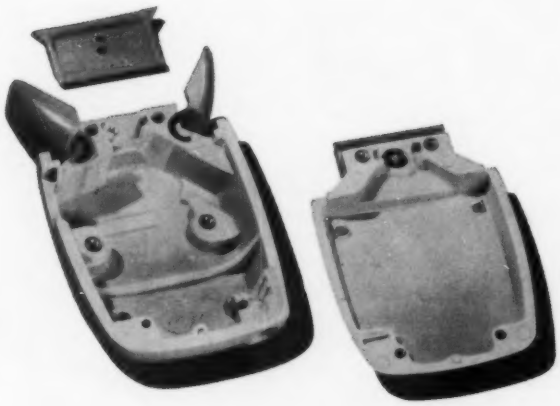
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Measuring Yellowing and Darkening in Weathered Plastics

by W. C. Hunt* and R. P. Bauman*

A procedure for evaluating the light stability of polyester resins is described. Its advantages are: 1) freedom from variations between different observers and different laboratories, 2) freedom from variation between the same observer under differing conditions of light and eye conditioning, and 3) the permanence of evaluation.

IT IS well known that many organic materials undergo certain physical changes after exposure to sunlight. In the case of glass-reinforced polyester sheet, now commonly used in outdoor applications, darkening, loss of clarity, and yellowing of the sheets have limited their usefulness. During development work aimed at formulating a light-stable Stypol[1] polyester resin, it became apparent that an objective means of evaluating resins would be quite helpful. It was considered desirable to separate the change due to exposure into two factors: 1) change in yellowness, and 2) change in clarity.

Theory

Color is produced in an object when light of different wavelengths is absorbed to different extents. The eye will see principally the "complement" of the absorbed color (see Fig. 1). If red light is absorbed, the body will appear green by transmitted light; if violet light is absorbed, the body will appear yellow, and so forth. Viewing the transmitted light, the eye has the ability to pair off complementary colors and record, as sensible color, only the imbalance. To measure color objectively, therefore, we must measure the imbalance between colors—that is, we must measure the differences in intensity of transmitted light of different wavelengths.

Absorption in the visible and ultra-violet regions is due to transitions from one electronic state of the molecule, of energy E_0, to another state of electronic motion, of energy E_1. The frequency of the *absorbed* light is then

$$\lambda = \frac{E_1 - E_0}{h}$$

where h is a known constant. Only when there exists a level E_1 of energy not too much greater than the "ground state" energy, E_0, is light of a visible frequency absorbed. It is much more common for materials to absorb frequencies higher than this, so that the absorption falls in the ultra-violet region. If the compound contains aromatic groupings or such elements as sulfur, oxygen, or nitrogen, the absorption may fall in the near ultra-violet above 3000 Angstroms.

If the region of principal absorption falls in the near ultra-violet, it may frequently happen that the absorption band is so broad that it spreads into the edge of the visible region. Under these conditions violet light is absorbed, and the body appears yellow. This is the nature of the yellow discoloration so frequently observed in organic matter.

In determining quantitatively the amount of yellowing, it is not sufficient to measure the absorption in the violet region of the spectrum, since it is only the imbalance in frequencies absorbed that produces color. For the general case of a colored material it is a tedious operation to determine from the absorption spectrum the exact color.[2] The case of a yellowed plastic plate is amenable to a considerable simplification. The absorption spectrum of a clear plastic plate is shown in Fig. 2, p. 158. As can be seen, there is no absorption above 6000 A. (the apparent absorption due to reflection losses at the two faces of the plate has been subtracted from the entire curve) and that the absorption below this increases smoothly. For this idealized case we may consider the curves from different samples to comprise a family of curves with only one parameter. It is then possible to record the amount of absorption in the violet region, and hence the yellowness, by means of only one number.

The primary deviation from the above case is that caused by darkening of the plate. We may treat this by adding a second parameter. A spectrum of a typical plate appears in Fig. 3, p. 158. From the dotted line it will be seen that this curve may be considered as a superposition of a uniform absorption and the idealized absorption treated above. Provided the vertical axis is in units of absorbance, the two parts may be considered independently.

Beer's law states that $I = I_0 10^{-abc}$ or $\log_{10} I_0 = abc$, where I_0 is the initial intensity, I is the final intensity, c is the concentration of the absorbing material, b is the path length, and a is the absorptivity, which is a constant for a given material for each wavelength. The product $A = abc$ is known as absorbance. Absorbance is related to transmission thus: $A = -\log T$.

The determination of relative yellowness in a series of plastic plates

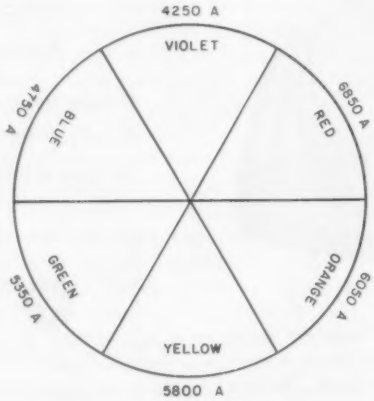


Fig. 1—Complementary colors are those diagonally opposite on the above color wheel. Absorption of one color causes the complementary color to predominate in the transmitted light. Approximate wavelengths are given for each color

* Mellon Institute of Industrial Research, Pittsburgh 13, Pa.

[1] Manufactured by H. H. Robertson Co., Pittsburgh, Pa.

[2] For a detailed discussion of this problem and many references, see M. G. Mellon, "Analytical Absorption Spectroscopy", chapter 9, Measurement and Specification of Color, by D. B. Judd, John Wiley and Sons, Inc., New York (1950).

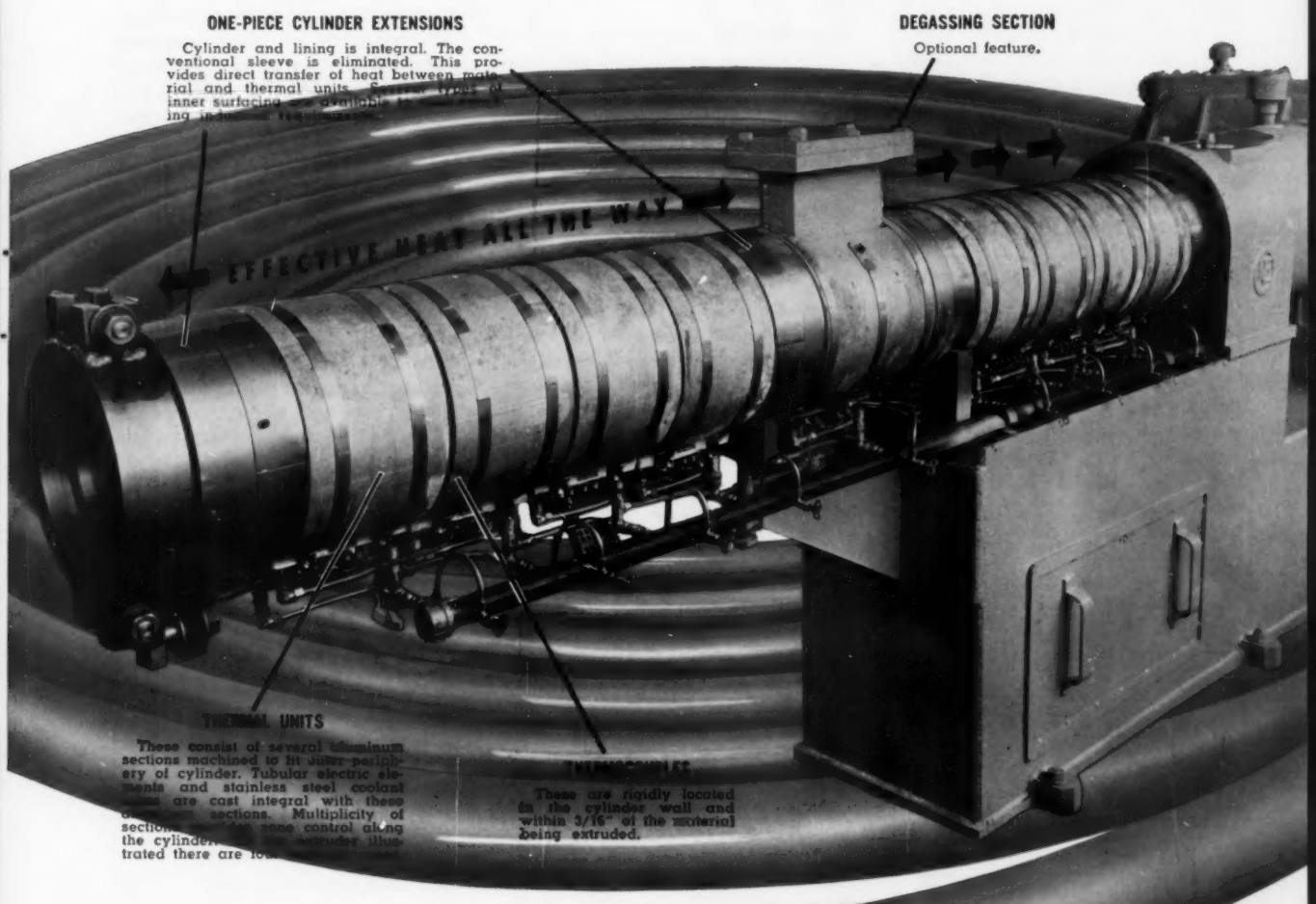
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Table I—Effect of Exposure in a Fadometer on the Clarity and Yellowness of Stypol Polyester Resin

Stypol resin	Thickness of specimen	Before exposure: Absorbance at 4500 A.	6000 A.	7500 A.	Clarity[a]	Yellowness	After 1000 hr. exposure: Absorbance at 4500 A.	6000 A.	7500 A.	Clarity[a]	Yellowness	Decrease in clarity	Increase in Yellowness
	in.				%					%		%	
705S	0.125	0.107	0.054	0.063	97.3	0.053	0.154	0.081	0.069	91.4	0.073	5.9	0.020
407S	0.125	0.064	0.047	0.045	98.9	0.017	0.200	0.092	0.075	89.2	0.108	9.7	0.091
407	0.125	0.064	0.047	0.045	98.9	0.017	0.675	0.353	0.275	48.9	0.322	50.0	0.305
114S	0.125	0.221	0.105	0.113	86.5	0.116	0.805	0.212	0.100	67.5	0.393	19.0	0.477
102	0.125	0.186	0.076	0.070	92.0	0.110	1.001	0.398	0.300	44.0	0.603	48.0	0.493

[a] Corrected for reflection losses.

may be conveniently carried out in the following manner. The absorbance is determined at 6000 and 7500 Angstroms. The findings should be very nearly the same, and may be taken as a measure of the amount of "darkness" of the plate. By converting absorbances at these wavelengths to percent transmission, we can obtain a measure of the clarity of the plastic plate both before and after exposure. The absorbance at 4500 A. is then measured, and from this value is subtracted the absorbance at 6000 Angstroms. The remainder represents the yellowness of the plate and may be taken directly as an index of yellowness.

Such an index of the amount of yellowness cannot conveniently be transformed, on an absolute basis, into the amount of yellowness observed by the eye. But the relative ordering of a series of plates as to the amount of yellowness has been found to be essentially the same by this method as by the eye, although a visual ordering is quite uncertain when the plate is not completely clear. Since one cannot readily transform this visual impression of color to an absolute scale, the degree of arbitrariness in the method outlined does not represent any loss over a visual determination.

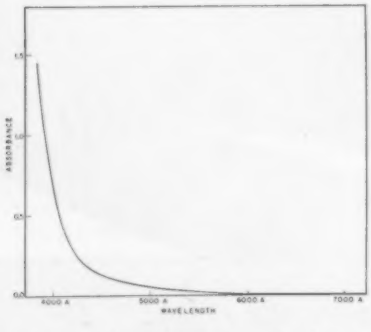


Fig. 2—Absorption spectrum of a clear (yellow) plastic plate. Yellow color arises from absorption of violet light

Experimental

Clear sheets of the polyester were obtained by casting the resin between ¼ in. thick glass plates, using Saran tubing as a U-shaped gasket and C-clamps to hold the plates together; ⅛-in. spacers were used to obtain the desired thickness. In order to obtain smooth and clear castings, elaborate preparation of the glass plates was necessary. After a thorough cleaning with soap and water, the plates were coated with a 4% solution of Vejin[3] in toluene. The plates were then wiped with clean cloths until no apparent trace of mold release remained. The resins were catalyzed with 1% of benzoyl peroxide, de-aerated, and poured between the plates. Gelation occurred after standing overnight at 120° F. The plates were given a final cure of 2 hr. at 240° F. and cooled gradually to room temperature.

An absorption spectrum in the visible range, 4000 to 8000 A., was run for each specimen using a Cary Recording Spectrophotometer. The method could be used equally well on other dispersive type instruments, such as the Beckman DU or the General Electric spectrometer. The principle could be extended to certain non-dispersive instruments, such as the Fisher filter photometer, by proper modification of the procedure. Glass-reinforced resins will in general scatter light rather drastically. Although this property does not too seriously affect the transmission properties for certain uses, all light scattered from the narrow beam is recorded as absorbed light by most spectrometers. It seems probable that the use of an integrating sphere (such as is used on the General Electric spectrometer) would make it possible to measure the yellowing of glass-reinforced plates by the same general technique.

[3] Vejin, Inc., Cincinnati, Ohio.

The specimens were exposed in a National Carbon XV Fadometer using Sunshine #145 carbons as the lower electrodes and #16 upper ultra-violet carbons as the upper electrodes. A $\frac{3}{32}$- to $\frac{5}{64}$-in. Corex D filter was used. The current was 30 to 33 amp. at 40 volts. The specimens were 10 in. from the arc. The temperature in the chamber averaged 140° F. The Fadometer used is rated at 1.4 standard fading hours per hour of operation. At the end of 1000 hr. exposure, absorption spectra in the visible range were again measured.

Results and Discussion

Table I is a compilation of the pertinent data on several polyester resins. Clarity was calculated by converting the respective absorb-

(*To page* 244)

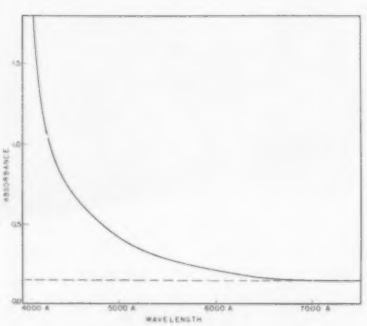
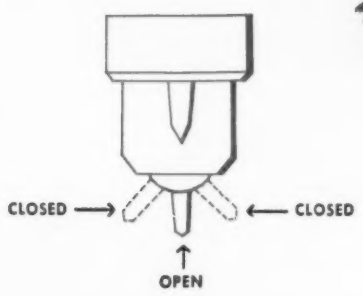


Fig. 3—Absorption spectrum of a typical plastic plate. Absorption may be considered as a sum of "darkening" effects (below dotted line) and "yellowing" effects (above dotted line)



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General

PLASTIC CAR IS HERE—WILL IT STAY? Chem. Eng. News *32*, 2180-83 (May 31, 1954). The history of the development of the glass fiber laminate car body is traced. The fabrication and assembly techniques used in the plastic car bodies now in production are discussed. Comparison of reinforced plastic bodies with steel bodies indicates that up to 15,000 production units, plastic has the edge economically. In addition, the plastic body presents simplified suspension problems because of the low weight; its center of gravity is lower; corrosion resistance is excellent; heat transfer properties give improved passenger comfort. Despite current enthusiasm, important market questions about plastic car bodies are not yet fully answered.

PLASTICS IN BUILDING. A SYMPOSIUM. Kunststoffe *44*, 241-50 (June 1954). The general importance of plastics in the building industry; plastics and the architect; plastic floor covers and profiles; plastics for wall coverings and furniture; plastic insulation; and plastics for plumbing fixtures are discussed.

NYLON IN INDUSTRY. Plastics (London) *19*, 105-07 (Apr. 1954). The properties and applications of two commercial grades of nylon molding powder are discussed. Basically, the nylon has excellent wear resistance, shock absorption, corrosion resistance, heat stability, ease of processing, and toughness. The material can be injection molded, extruded, and flame-sprayed as a coating. It is being used in such items as spectacle frames, beakers, combs, brushes, pipe lining, gears, and hammer heads.

Materials

EXPANDED PLASTICS. G. Salzmann. Kunststoff-Rundschau *1*, 55-58 (Mar. 1954). A short history of expanded plastics is given together with properties, preparation, and applications of expanded materials from polyvinyl chloride, rubber, polystyrene, polyurethane, urea-formaldehyde, and phenol-formaldehyde.

ELIMINATION OF COLD FLOW IN POLYISOBUTYLENE BY ACTIVE WHITE FILLERS. A. Weihe. Kunststoffe *44*, 103-04 (Mar. 1954). Oxides of metals of the second, third, and fourth groups of the periodic table as well as those of the iron group obtained pyrogenically in the gas phase are added to polyisobutylene, such as Oppanol B 200, to produce films and other products that show unusually high reversible extensibility and are very resistant to compressive loads. Additions of only 10 to 20% of the active white filler show marked improvements. The addition of the fillers open for polyisobutylene new applications in which it has been unsuited in the past due to excessive cold flow.

POLYESTER RESINS AND THEIR INDUSTRIAL APPLICATIONS. I. E. Muskat. SPE J. *10*, 28-29, 44-47 (Apr. 1954). Commercial polyester resins are generally of two types: polyallyl esters and unsaturated alkyds. Optimum properties and workable viscosities are obtained with unsaturated alkyd polyester resins by copolymerizing with a monomeric mono-functional resin, usually styrene. The concentration of copolymer used depends on the type of resin, working viscosity, and properties desired. Color and specific properties such as high heat resistance, fire resistance, and toughness can be obtained through the use of fillers. Polymerization of these resins is accomplished by means of any of a large number of peroxides. The resins are cured either through the application of heat or by means of room temperature accelerators. No pressure is required and no volatile products are given off. Applications include the fields of casting, laminating, adhesives, impregnation, compression molding, embedding, and photoelastic and coating compositions.

VINYL PASTE RESINS FOR TODAY AND TOMORROW. W. D. Todd. SPE J. *10*, 13-15, 39-40 (Mar. 1954). Vinyl pastes are dispersions of polyvinyl chloride or vinyl copolymers in non-aqueous liquids. They vary from thin liquids to putty-like solids and can be sprayed, printed, brushed, cast, spread, slushed, or extruded. The four types of vinyl pastes are: plastisols, in which the liquid phase consists entirely of a plasticizer; plastigels, which are plastisols with gel-like flow properties; organosols, in which the liquid phase contains volatile thinners; organogels, which are organosols with gel-like flow properties. Up to the present time, the greatest consumption of vinyl pastes has been in spread coating, such as the coating of fabric for upholstery, and other coated products such as flooring, wall covering, protective clothing, rug backing, and conveyor belting. Other applications of paste resins include dip coating of metal parts such as electroplating racks, slush molding of toys, and expanded vinyl compounds.

PVC PASTES IN ELECTRONICS. C. P. Fagan. Plastics (London) *19*, 110 (Apr. 1954). Polyvinyl chloride pastes may be used as potting compounds for sealing electronic components if the gelation temperature is reduced. This can be done by using very active plasticizers and using certain vinyl chloride-acetate and vinyl chloride-acrylate copolymers. A table of polyvinyl chloride paste formulations is given in which the gels may be processed at 45 to 100° C. in approximately 12 hr., rather than at 150° C. as is the case for ordinary PVC pastes.

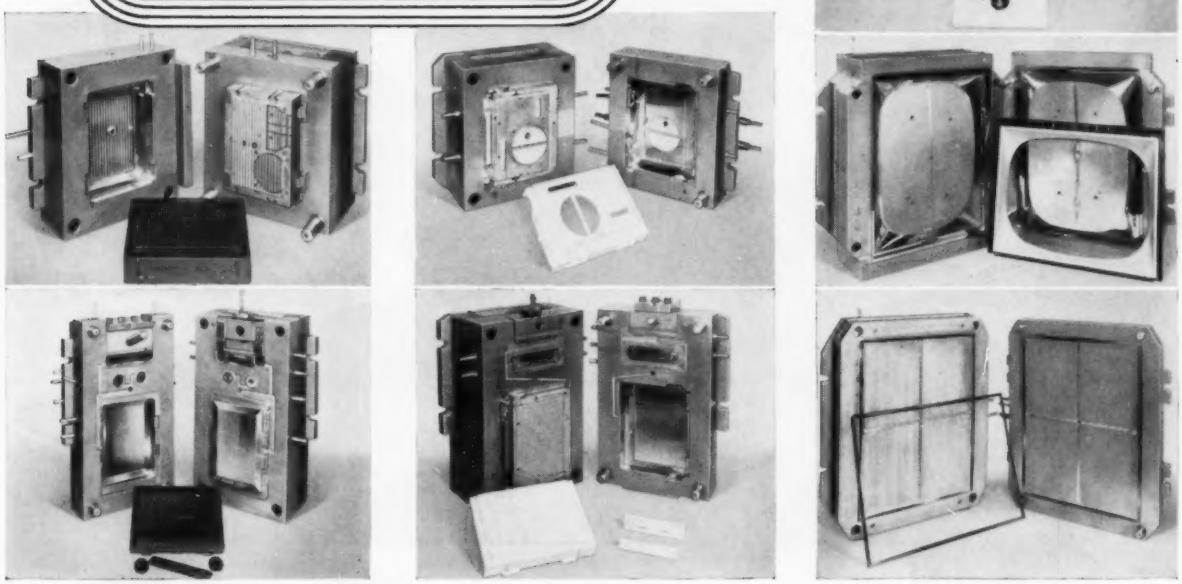
IMPROVING POLYVINYL CHLORIDE SHEETING AND UPHOLSTERY MATERIAL. W. Tischbein. Kuntstoffe *44*, 181-82 (April 1954). Plasticizer migration is a great problem in polyvinyl chloride sheeting and upholstery material. Hardening of the materials with simultaneous tackiness of the surface can be caused by the action of extracting oils and fats, of cellulose nitrate lacquers or films, or by increased temperatures. Coatings of polyamides and polyurethanes im-

(*To page* 164)

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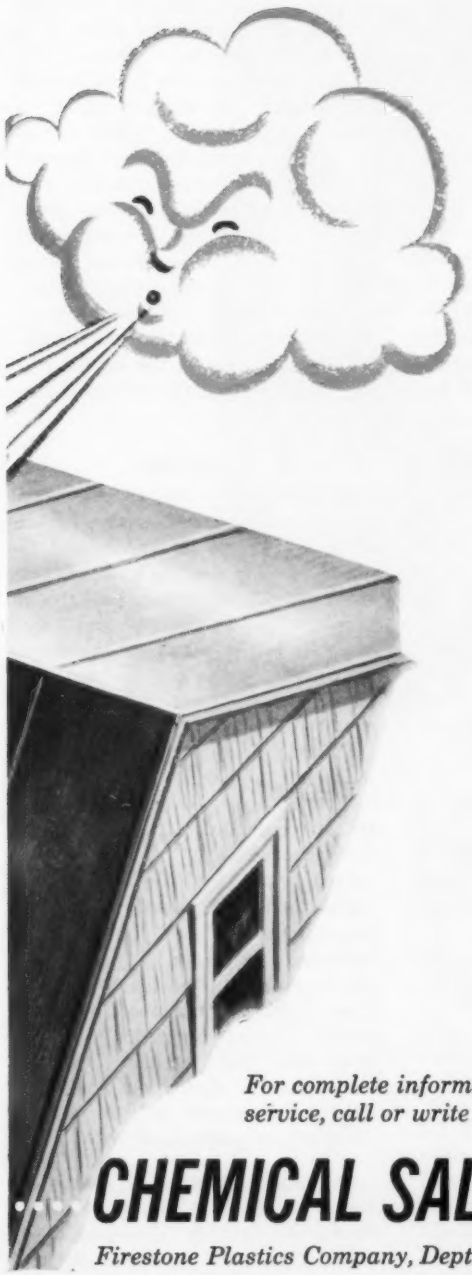
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prove the surface properties of polyvinyl chloride materials. Detailed descriptions of the coating techniques with newly developed polyamides and polyurethanes marketed under the trade names Definal M and Definal GK are given.

Molding and Fabricating

EXTRUSION OF FILM AND SHEETING. G. D. Kovach. SPE J. *10*, 24-27 (Apr. 1954). Among the reasons for the rapid growth of the extrusion industry are the growth of polyethylene packaging film which can be produced only by extrusion, and the growth of vacuum forming of thermoplastic sheet which can be produced most economically by extrusion. In addition, a much larger investment is required for a calendering plant. Calendered polyvinyl chloride film less than 3 mils thick has very poor strength characteristics whereas extruded film is excellent to 1 mil and lower. Methods and techniques of film extrusion are discussed. Factors influencing rigid sheet extrusion are preparation of stock, screen design and heating method, die design, and take-off methods. The extrusion of polyethylene film is described in detail as to methods used and problems involved. The extrusion of plasticized polyvinyl chloride is described from the aspects of formulation, preparation of stock, and methods of extrusion. Both flat film extrusion and circular blow extrusion are described.

SOME PROBLEMS IN INJECTION MOLDING IN CELLULOSE ACETATE. H. J. Lovell. Brit. Plastics *27*, 138-39 (Apr. 1954). Some of the difficulties encountered in molding cellulose acetate are described and methods are suggested for their elimination. The defects discussed are discoloration, "sinks" and "voids," silver surface, dull finish, shrinkage after molding, flow lines, burn marks, and brittleness or surface laminations. Strain photographs of three sets of test pieces molded at different temperatures show the decrease in strain which takes place with increased molding temperature.

GRANULATION OF PLASTICS. H. Rumpf. Kunststoffe *44*, 43-48; 93-103 (Feb., Mar. 1954). Many granulating problems are involved in the preparation and manufacture of plastics and many machines, often for special purposes, have been developed. The following problems concerned with various mechanical methods are discussed from the theoretical physical viewpoint: production of dust-free granulates; granulated thermoplastics, and the granulation of polymeric powders to very fine particles. The fracture process in individual solids is discussed, as well as the fundamentals of mechanical granulation of plastics. The various kinds of granulating mills used in the plastics industry are described.

MACHINERY FOR MOLDING AND FABRICATING PLASTICS. SPECIAL EDITION. Der Plastverbraucher 5, 2-36 (Jan. 1954). The most important machinery used in Germany for the molding and fabricating of plastics is reviewed. Pictures, names of manufacturers, and other data are given.

Applications

MOLDED SILICONES IN THE ELECTRICAL INDUSTRY. P. Nowack and E. Rickling. Kunststoffe *44*, 191-207 (May 1954). Two new classes of heat-resistant insulating materials have been specified for electrical instruments, one requiring continuous heat resistance up to 311° F. and the other up to 356° F. Two silicone resins were investigated, one a copolymer containing methyl and phenyl groups at a ratio of 1.0 : 0.65 (Type A) and the other one containing fewer phenyl groups (Type B). The content of trifunctional siloxane units also differed in the two resins. Flexural strength and spalling resistance before and after 1 yr. at 356° F. of a glass-fiber silicone laminate with 50% resin content showed different results but no adverse aging effects. In general, it appears that Type A will resist high temperatures better than Type B because the phenyl groups, being more stable to oxidation, stabilize the methyl groups. Insulating materials based on silicones, if correctly selected, are well suited for electric motors and transformer construction, especially for those used under difficult working conditions.

REINFORCED PLASTICS ROLLERS FOR CONVEYORS. Plastics (London) *19*, 118 (Apr. 1954). A conveyor roller made of reinforced plastics was designed to overcome safety difficulties encountered with the use of conventional steel rollers in coal mines. The hollow cylindrical body is made of glass fiber reinforced resin and will withstand wet or corrosive conditions that would seriously shorten the life of steel rollers. The plastic rollers are also claimed to eliminate the risk of starting fires that is attributed to steel conveyors that are conventionally used.

NEW SURFACE HEATER FOR AIRCRAFT DE-ICING. Plastics (London) *19*, 116-117 (Apr. 1954). A patented electric surface heater designed mainly for de-icing aircraft is described. Both the heating element and the insulation are sprayed directly onto the surface to be protected. This is of particular advantage where compound curves are to be protected. The heater mat consists of: 1) a layer of epoxy resin, which serves both as an electrical and thermal insulation between the heater element and the surface aircraft structure; 2) the heating element, which may be copper or aluminum and is also applied by flame-spraying process; and 3) a surface layer of resin of the same type as the base insulation, which protects the heater element both electrically and mechanically.

Properties

QUALITATIVE INFRA-RED ANALYSIS OF POLYPHENYLBUTADIENES. P. de Radzitski, M. C. de Wilde, and G. Smets. J. Polymer Sci. *13*, 477-85 (May 1954). The infra-red spectra of synthetic poly-1-phenyl- and poly-2-phenylbutadienes were examined, principally in the region from 9 to 15 μ. The different intramolecular structures of these polymers, corresponding to the different types of monomer additions (1,4, 1,2, and 3,4), were examined by this method; the data are in complete agreement with the chemical results as reported previously. The influence of the method of polymerization on the internal structures of the polymers is taken in evidence; the presence of the aromatic substituent in position 1 or 2 in the monomer molecule exerts a large influence on the position and the intensity of the characteristic absorption bands, if they are compared with the results for synthetic polyisoprenes.

PNEUMATIC THICKNESS MEASUREMENTS OF HIGHLY ELASTIC PLASTIC FILMS. A. Dittrich. Kunststoffe *44*, 87-91 (Mar. 1954). In the production



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of plastic films it is difficult to control the thickness of the film in the viscous state. The Solex method measures distances very accurately and makes contact by hand unnecessary, thereby avoiding marring of the surface. It is shown that with the use of a special nozzle it becomes possible to apply the Solex method for this purpose and to calculate the data when the functional ratio of the nozzle values to pressure, distance, and the elastic modulus of the viscous material are known. Conversely, the elastic modulus of the film can also be determined.

LITERATURE REVIEW ON JELLY STRENGTH TESTING. Brit. Gelatine & Glue Res. Assoc. Abstracts *5*, 1-11 (Feb. 1954). The basic physics of gel strength is reviewed and the various methods for measuring gel strength are described in detail.

ARCING PERFORMANCE OF PLASTICS INSULATION. T. J. Martin and R. L. Hauter. Electrical Manuf. *53*, 102-07 (Apr. 1954). The arc resistances of phenolic, modified phenolic, mineral-filled polyester, glass-filled polyester, epoxy, woodflour-filled melamine, mineral-filled melamine, Teflon, and glass-bonded mica under severe test conditions are reported.

EFFECT OF ULTRASOUND ON THERMOPLASTIC MELTS. E. C. Bernhardt. Ind. Eng. Chem. *46*, 742-46 (Apr. 1954). In an investigation of the effects of ultrasound on polystyrene, polyethylene, and plasticized polyvinyl chloride, the following observations were made. Ultrasonic energy has no depolymerizing effect upon the molten thermoplastics in the ranges of temperature, frequency, and energy investigated. Ultrasonic energy absorption in thermoplastic melts causes a rapid rise in temperature. Absorption is dependent upon the frequency of the sound waves. In the three samples evaluated, a frequency near 1000 kc. produced the greatest effect. Ultrasonic energy causes molecular orientation in a plane perpendicular to the direction of the sound waves. Ultrasonic energy could be used to aid in the homogenization and in the dispersion of colorants and fillers in plastic melts. The fact that ultrasound does not degrade the molecular structure of plastic melts suggests that it may be considered for a number of possible future applications in plastics processing. In particular,

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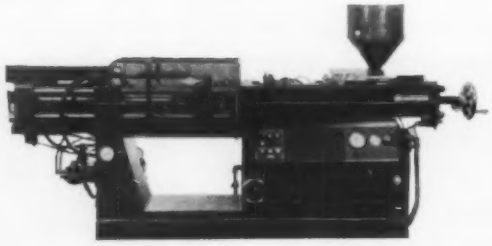
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ultrasound offers a means for rapid and local internal heating of polar or nonpolar plastics. Thus, it could provide a new means for welding and heat-sealing these materials, and may aid in other forming operations. The fact that ultrasound may cause molecular orientation without mechanical flow or deformation should also prove to be of practical value in forming and molding processes.

Testing

ANALYSIS OF CELLULOSE FIBERS IMPREGNATED WITH AMINO RESINS. S. Kündig. Eidgenössische Materialprüfungs- und Versuchsanstalt für Industrie, Bauwesen und Gewerbe, Zürich/St. Gallen, Switzerland. 46 p. 1953. Urea- and melamine-formaldehyde resins are used in large quantities to improve the crease resistance of textiles made of regenerated cellulose. Urea-formaldehyde is cheaper but requires an addition of 10% or more while 5 to 7% of the more expensive melamine-formaldehyde is usually sufficient. The various quantitative methods of analysis of cellulose fibers impregnated with amino resins are discussed. A formula for resin content based on the determination of nitrogen and formaldehyde in cellulose fibers treated with amino resins is developed. This method makes it possible to determine the resin content of finished dyed or undyed textiles containing either urea-formaldehyde on melamine-formaldehyde resins but with no other finishing agents containing nitrogen. Pure melamine-formaldehyde resin was hydrolyzed in water with a pH of approximately 6.6 at 174° C. In a subsequent qualitative analysis of the hydrolysis products, traces of volatile aliphatic amines and ammonium salts were found indicating that the melamine structure remains completely unchanged. The picrate method confirms this result. The melamine content of a solution obtained by the hydrolysis of melamine-formaldehyde resin in water was determined by picrate precipitation. But this determination is only possible under certain conditions, that is, constant pH value of the water, constant amount of water, constant temperature and time, and the same resin, depends to a large degree on the amount of resin added.

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COMPOSITE. H. L. Becher (to Homasote). U.S. 2,680,102, June 1. Composite of woody material, an aminoplast, and a chlorinated hydrocarbon.

POLYESTERS. D. E. Cordier (to Allied Chemical). U.S. 2,680,104, June 1. Polyester resins containing a filler treated with an amine-aldehyde condensate.

COPOLYMERS. C. B. Havens (to Dow). U. S. 2,680,106, June 1. Copolymeric vinylidene chloride compositions.

POLYMERS. F. Schmidt (to Farbenfabriken Bayer). U.S. 2,680,108, June 1. Reaction products of higher molecular hydroxy-compounds and a titanium complex.

POLYMERS. H. C. Stevens and F. E. Kung (to Columbia-Southern Chemical). U.S. 2,680,109, June 1. Allyl-2,3-epoxybutyrate polymers.

COPOLYMERS. G. A. Loughran, J. R. Dudley, and E. L. Kropa (to American Cyanamid). U.S. 2,680,-110, June 1. Copolymers of N-methylol acrylamide.

POLYMERS. W. O. Forshey, Jr. and J. E. Kirby (to Du Pont). U.S. 2,-680,112, June 1. Polymeric quaternary ammonium polytungstates.

HEAT SEALING. R. E. Stanton (to Celanese). U.S. 2,680,470, June 8. Machine for sealing films.

HEAT SEALING. L. P. Mercer (to Milprint). U.S. 2,680,471, June 8. Machine for sealing films.

ATTACHMENT MEANS. O. A. Hansen and J. A. Lampman (to Northrop Aircraft). U.S. 2,680,582, June 8. Means for attaching plastic canopy to a metal rim.

WELL LOGGING. J. D. Upham (to Phillips Petroleum). U.S. 2,680,595, June 8. Sealing porous boreholes with urea resins.

PAPER. W. C. Dearing (to Allied Chemical). U.S. 2,680,682, June 8. Urea-formaldehyde treatment for wet-strengthening paper.

PLASTIC. H. S. Olson and R. C. Danison (to Diamond Alkali). U.S. 2,680,691, June 8. Flame-resistant cellulose acetate butyrate.

METALLIZING. J. S. Judd (to Lyon). U.S. 2,680,695, June 8. Silver coating plastics.

CONDUCTIVE SHEET. M. D. Rubin. U.S. 2,680,699, June 8. Phenolic laminate with metal film on surface.

LAMINATE. G. L. Meyers (to Eagle-Picher). U.S. 2,680,700, June 8. Decorative laminates.

POLYMERS. T. F. Anderson (to Allied Chemical). U.S. 2,680,722, June 8. Polymerizable polyallyl ester composition.

COATINGS. R. D. Oppenheim (to Spraylat). U.S. 2,680,724, June 8. Polyvinyl butyral coatings.

POLYVINYL ACETALS. C. H. Jarboe (to Du Pont). U.S. 2,680,727, June 8. Polyvinyl acetals stabilized with 2-thiazoline-2-thiol.

POLYMERS. F. Reeder, E. R. Wallsgrove (to Courtaulds). U.S. 2,680,-728, June 8. Polymers from dihydric phenols and disulfonic esters of diols.

PAPER TREATMENT. W. C. Dearing (to Allied Chemical). U.S. 2,680,734, June 8. Urea resins for wet-strength paper.

RESINS. V. W. Fegley and S. P. Rowland (to Rohm and Haas). U.S. 2,680,735, June 8. Resinous esters of acrylic acid.

MOLDING. H. Corbett, U.S. 2,680,-880, June 15. Machine for combined extrusion and injection molding.

MOLDING. S. G. Mock. U.S. 2,680,-881, June 15. Compression molding.

GOGGLES. J. B. Hirschmann and G. P. Theroux. U.S. 2,680,882, June 15. Apparatus for making plastic goggles.

MOLDING. B. D. Ashbaugh (to H-P-M Development). U.S. 2,680,883, June 15. Injection molding machine.

SEALING. R. F. Gray (to Injection Molding). U.S. 2,681,097, June 15. Machine for sealing parts of a plastic article.

ION-EXCHANGE. G. W. Bodamer (to Rohm and Haas). U.S. 2,681,319-20, June 15. Permselective films of ion exchange resins.

POROUS PLASTICS. F. Stastny and R. Gaeth (to Badische Anilin und Soda Fabrik). U.S. 2,681,321, June 15. Porous masses of polystyrene.

RECORD. F. Groff, P. B. Potter, and R. W. Smith (to Carbide and Carbon). U.S. 2,681,323, June 15. Polystyrene phonograph record.

COATING. S. Hochberg (to Du Pont). U.S. 2,681,324, June 15. Polytetrafluoroethylene coatings.

COATING. C. J. Christianson (to Sherwin-Williams). U.S. 2,681,326, June 15. Fire-retardant coating.

STABILIZERS. G. W. Stanton and F. A. Ehlers (to Dow). U.S. 2,681,-328-9-30, June 15. Acrylonitrile polymers stabilized with beta-hydroxy tertiary amines, N-alkyl hydroxy acetamides, and hydroxymethyl formamides.

TRIPOLYMERS. L. H. Howland and V. S. Chambers (to U.S. Rubber). U.S. 2,681,331, June 15. Tripolymers of butadiene, alkyl butadiene, and vinyl pyridine.

SEPARATOR. V. L. Smithers. U.S. 2,681,377, June 15. Sheets of foamed phenolic resin.

MOLDING. E. E. Heinzelman (to Armstrong Cork). U.S. 2,681,471, June 22. Rotary molding machine.

MOLDING. D. G. Rempel (to Vinl-Cast). U.S. 2,681,472, June 22. Plastic molding machine.

PULP MOLDING. R. A. M. Palese and S. H. A. Young (to American Cyanamid). U.S. 2,681,599, June 22. Molding a slurry of cellulosic fibers and melamine resin and impregnating with polyester resin.

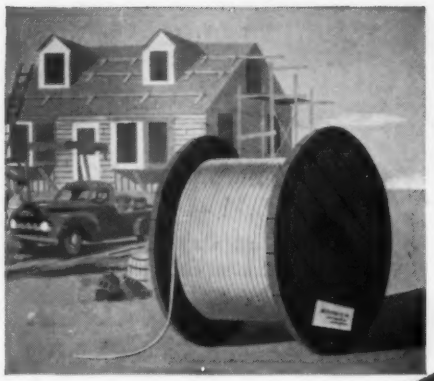
COATING. G. C. Simpson (to Masonite). U.S. 2,681,637, June 22. Applying resin particles to a surface.

WELDING. R. S. Arkless. U.S. 2,681,-685, June 22. Plastic welding device.

COMPOSITE SHEET. M. Seymour (to

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DESCRIPTIVE DATA

CELANESE PLASTICIZER	GRADE	APPEARANCE	COLOR APHA Max.	SPECIFIC GRAVITY @ 20/20°C.	ACIDITY	ESTER VALUE % Min.	PERMANGANATE TIME, Min. (in Minutes)	REFRACTIVE INDEX @ $n\frac{20°C.}{D}$
LINDOL* tricresyl phosphate coal tar base	Technical	Clear transparent liquid	75	1.165 ± .005	0.01 (3)	99	30	1.556
CELLUFLEX* DBP dibutyl phthalate	Technical	Clear transparent liquid	50	1.045 ± .001	0.01 (2)	98	—	1.4889
CELLUFLEX* 179C tricresyl phosphate petroleum base	Technical	Clear transparent liquid	150	1.165 ± .005	0.01 (3)	99	30	1.553 (5)
CELLUFLEX* 112 a mixed ester	Technical	Clear transparent liquid	40	1.210 ± .005	0.01 (3)	99	30	1.560 (5)
CELLUFLEX* TPP triphenyl phosphate	Technical	White flakes	20 (4)	1.221 (1)	0.003 (3)	99	30	1.550 (6)
CELLUFLEX* DOP dioctyl phthalate	Technical	Clear transparent liquid	50	0.985 ± .002	0.01 (2)	98	—	1.4859

(1) @ 60/60°C. (2) % as phthalic, max. (3) % as phosphoric, max. (4) Molten (5) @ $n\frac{25°C.}{D}$ (6) @ $n\frac{60°C.}{D}$

Celluflex 179C — tricresyl phosphate — is the standard of comparison among flame-resistant plasticizers for electrical applications. It has very low volatility, excellent solvent power, a high degree of permanence . . . produces a tough, flexible vinyl film with excellent weathering properties.

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B. B. Chemical). U.S. 2,681,877, June 22. Adhesively coated plastic sheet.

RESINS. H. Hoenel. U.S. 2,681,894, June 22. Water-soluble resins.

RESIN. E. R. Nielsen. U.S. 2,681,896, June 22. Condensing and polymerizing furfuryl alcohol.

COATINGS. C. Frazier and L. E. Cadwell (to American Cyanamid). U.S. 2,681,897, June 22. Aminoplast coatings.

COPOLYMERS. L. E. Daly (to U.S. Rubber). U.S. 2,681,898, June 22. Blends of copolymers of styrene and butadiene.

RESINS. R. A. Holmes, J. F. Murphy, and R. L. Werkheiser (to Monsanto). U.S. 2,681,900, June 22. Stabilized halogen-containing vinylidene resins.

RESINS. Q. T. Wiles and D. W. Elam (to Shell). U.S. 2,681,901, June 22. Glycidyl-polyether resins.

MOLDING COMPOSITIONS. F. B. Rosenberger (to Allied Chemical). U.S. 2,681,902, June 22. Molding compositions of polymethylenediurea-formaldehyde.

FIXTURE. S. P. Kish (to Kish Plastic Products). U.S. 2,682,111, June 29. Dimensionally stable body of expanded plastic.

LAMINATES. H. Nagin (to Reliance Steel). U.S. 2,682,292, June 29. Continuous forming of fiber and plastic shapes.

FABRIC. R. E. Thomas (to Du Pont). U.S. 2,682,484, June 29. Fabric coated with polyvinyl chloride.

FABRIC. S. W. Strickman (to Gittlin Bag). U.S. 2,682,485, June 29. Fabric coated with polyvinyl chloride acetate.

ADHESIVE. A. Gams, W. Kraus, E. Preiswerk, G. Widmer, and W. Wieland (to Ciba). U.S. 2,682,490, June 29. Ethylene oxide-dihydroxyphenol adhesive.

PANELS. S. H. Hahn (to Dalmo Victor). U.S. 2,682,491, June 29. Skin for doubly curved sandwich type honeycomb panels.

ORGANO-SILANES. C. L. Agre (to Minnesota Mining). U.S. 2,682,512, June 29. Unsaturated organo-silanes.

CELLULOSE ESTERS. I. Skeist (to Celanese). U.S. 2,682,513, June 29. Preparing cellulose esters.

RESINS. H. A. Newey (to Shell). U.S. 2,682,514, June 29. Glycidyl polyether of a polyhydric phenol.

ADHESIVE. M. Naps (to Shell). U.S. 2,682,515, June 29. Polyepoxide adhesive.

COATING. A. G. Asaff (to Callaghan-Hession). U.S. 2,682,517, June 29. Vinyl copolymer floor and wall coatings.

POLYMERS. J. R. Caldwell (to Eastman Kodak). U.S. 2,682,518-9, June 29. Mixtures of polyacrylonitrile with interpolymers of isopropenyl acetate and alkyl acrylates.

RESINS. C. K. Bump and F. J. Quinn (to Monsanto). U.S. 2,682,520, June 29. Polyvinyl acetal composition.

POLYMERS. H. W. Coover, Jr. (to Eastman Kodak). U.S. 2,682,521-2, June 29. Polymeric organo-phosphonates.

POLYAMIDES. D. D. Coffman (to Du Pont). U.S. 2,682,524, June 29.

Polyamides cross-linked by oxalic acid.

CROSS LINKING. H. L. Jackson (to Du Pont). U.S. 2,682,525, June 29. Cross-linking polymeric polyprimary amines with diaryl carbonates.

INTERLINKING POLYMERS. P. J. Flory (to Goodyear). U.S. 2,682,526, June 29. Interlinking polymers with polylactams.

POLYMERS. J. B. Dickey and H. W. Coover, Jr. (to Eastman Kodak). U.S. 2,682,527, June 29. Polymers of esters of alpha-hydroxymethyl acrylonitrile.

POLYMERIZATION. E. J. Vandenberg (to Hercules). U.S. 2,682,528, June 29. Low-temperature polymerization using resin acid soap.

POLYMERIZATION. J. E. Wicklatz and F. M. Smith (to Phillips Petroleum). U.S. 2,682,529, June 29. Polymerization of vinylidene compounds.

ACETAL. R. L. Adelman (to Du Pont). U.S. 2,682,532, June 29. Production of polyacetals.

CELLULOSE DERIVATIVES. W. B. Hewson (to Hercules). U.S. 2,682,534, June 29. Cellulose acetate-sorbate.

TUBE. H. A. Smith. U.S. 2,682,974, July 6. Plastic tube for pastes.

FLOOR COVERING. J. R. Jones and E. R. Erb, Jr. (to Paulsboro). U.S. 2,683,094, July 6. Vinyl floor coverings.

COATING. L. P. Biefeld (to Owens-Corning). U.S. 2,683,097, July 6. Glass fibers coated with unsaturated polysiloxanolate.

RESINS. O. B. Edgar and B. Jacob (to Imperial Chemical). U.S. 2,683,-100, July 6. Terephthalic copolyester insulating varnish.

LAMINATE. M. A. Smook and I. D. Roche (to Du Pont). U.S. 2,683,103, July 6. Curing polymers with oximes.

RESIN. M. T. Harvey and P. L. Rosamilia (to Harvel). U.S. 2,683,-104, July 6. Starch-acetone-formaldehyde composition.

LAMINATES. C. T. Forbes and D. M. Hatch, Jr. (to Hughes Aircraft). U.S. 2,683,105, July 6. Method of producing plastic laminates.

ION EXCHANGE. G. F. D'Alelio (to Koppers). U.S. 2,683,124-5, July 6. Ion-exchange resins from a vinyl heterocyclic amino compound and a vinyl-cyclohexene.

RESIN. J. Nichols (to Interchemical). U.S. 2,683,126, July 6. Resins from a cyclic adduct of a conjugated diene and an unsaturated alcohol.

COPOLYMERS. G. A. Griess (to Dow). U.S. 2,683,127, July 6. Copolymers of a vinyl aromatic, an isopropenyl aromatic, and a rubbery diene polymer.

POLYMERS. G. F. D'Alelio (to Koppers). U.S. 2,683,128, July 6. Copolymer of substituted urea and acrylonitrile.

RESINS. G. F. D'Alelio (to Koppers). U.S. 2,683,130, July 6. Phenol-aldehyde-epoxy resins.

RESINS. W. E. Cass (to General Electric). U.S. 2,683,131, July 6. Acidic polyester-ethoxyline.

RESIN. M. T. Harvey and P. L. Rosamilia (to Harvel). U.S. 2,683,-133, July 6. Acetone-formaldehyde resin.

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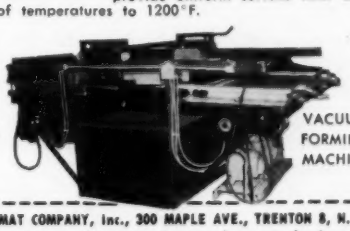
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Temperature Regulators—Supplied with three-way valves, a line of regulators, developed for use on internal combustion engines and in other temperature control applications, is equipped with a solid-type (rather than the conventional liquid type) thermal element. The regulators contain a "Power-Pill" unit which is charged with a solid, wax-like compound. When subjected to heat, this compound melts and expands, thereby generating pressure. The heated liquid returns to a solid state upon cooling. This design makes the regulators insensitive to internal pressures of the system in which they are installed. The regulators contain from one to four Power-Pill units, depending on the size of the valves, which are available in sizes ranging from 2 to 6 inches. Maintenance and adjustment can be made without removing the valve from the pipeline. Temperature settings are available from 120 to 190° F., in 10 to 15° increments. *Robertshaw-Fulton Controls Co., Fulton Sylphon Div., Box 400, Knoxville, Tenn.*

Convertible Generator—Full, normal capacity range of plastics welding operations is claimed to be covered by the Ectrotherm high-frequency generator line. The basic unit has all operating sub-assemblies mounted on sliding drawer-type chassis units for immediate change-over of power supply and oscillator units. This arrangement not only simplifies service and maintenance, but also permits on-the-job conversion.

In the higher-powered type (Model 253), the generator has an input power of 4000 watts d.-c., providing average weld lengths of 20 in., with a maximum up to 60 in. (on 0.020 vinyl). Output frequency is 27 mc; weight is 113 pounds.

Fitted with lower-powered sub-assemblies, the generator (Model 153), has a 2000-watt d.-c. input, alternate output frequencies of 27 and 41 mc., and weighs 94 pounds. Average weld length is 20 in., with a maximum up to 36 in. (on 0.020 vinyl).

Both models operate from 60-cycle, single-phase power; Model 153 uses a 115-v. supply, Model 253 uses a 230-v. supply. Both generator models are identical in size—12 by 24 by 21 inches.

Units include air filters, exhaust blowers, no-fuse circuit breakers, safety electrical interlocks, r.-f. traps, and line filters. Controls are located on the front panel. Arrangements are provided for either top or front mounting of either electrode presses or magnetic-bar electrodes. *Electronic Processes Corp., 1170 San Antonio Rd., Los Altos, Calif.*

Vacuum Metallizer—Designed for use by companies with moderate production requirements (jewelry manufacturers, custom molders, custom metal finishing plants, and others whose volume of metallizing work is small), Model 428 vacuum metallizer has a chamber 36 in. in diameter and 60 in. long. The unit has an integral vacuum pumping system, consisting of an oil diffusion pump and a rotary mechanical forepump, which brings the chamber down to the metallizing pressure of 0.5 microns in about 10 minutes. The work-holding rack accommodates four standard rotating fixtures. These fixtures are identical to those used in the company's larger model metallizers. The racks can, therefore, be retained and used in the larger units in the event that the customer's production requirements increase to the point where a 48- or a 72-in. machine would be justified. *F. J. Stokes Machine Co., 5500 Tabor Rd., Philadelphia 20, Pa.*



Stokes' Model 428 vacuum metallizer for limited production runs has 36-in. diameter, 60 in. long chamber

Inspection Instrument—Model C Small Parts Comparator is designed for 100% optical production inspection against an enlarged drawing of small, odd-shaped parts such as are produced by manufacturers of instruments, business machines, typewriters, electronic components, and the like. The unit has been engineered for optical production inspection only and is said, therefore, to provide maximum efficiency for this single task, without need of compromise to accomplish other operations.

The instrument has a work stage and a vertical light beam, permitting many parts to be laid flat on the stage without use of holding fixtures. Stage and screen are positioned so that they are in line with the operator's hand and vision. Light source is built into the instrument and the image is upright and unreversed. Magnifications of 20X, 25X, 31¼X, and 62½X are available. *George Scherr Optical Tools, Inc., 200 Lafayette St., New York 12, N. Y.*

Injection Machine—Designed for molding of larger size table model radio cabinets, toys, refrigerator parts, etc., Model 400-H-20 20/28-oz. injection machine is said to have an injection speed which is 60% higher than that found on comparable 16-oz. models. The unit has a horsepower rating of 50 (compared to 30 hp. on the 16-oz. machines) and incorporates an automatic weigh feeder of a compensating type as standard equipment.

The injection unit is mounted on ways, actuated by a single hydraulic cylinder, and hydraulically retractable. The injection nozzle is hydrau-



MODEL
H-250

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VAN DORN
2½ Oz. Automatic Press

Check these outstanding features of this ultra-modern Van Dorn injection press:—

GREATER CAPACITY— Up to 2½ oz.; smaller pieces at faster cycles.

HI-SPEED PERFORMANCE— Plasticizes material at 22 lbs. plus per hour.

FASTER PRODUCTION—Will attain up to 720 cycles per hour (dry run).

HIGHEST EFFICIENCY—Due to water cooling of injection plunger, transfer hopper and oil cooler.

ACCESSIBILITY— Due to simple platen clamp device for purging to change material or color.

MORE SAFETY— Mold hydraulic mechanism makes press non-operative unless molded part is completely ejected.

SIMPLER OPERATION—Due to automatic, adjustable material metering device.

MULTIPLE OPERATIONS—Minimum operator attention by use of larger hopper and light that indicates when press needs attention.

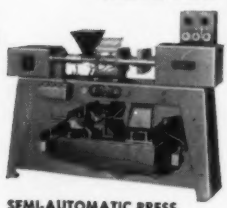
SELECTIVE CONTROL—Merely throw toggle switch to operate press semi-automatically.

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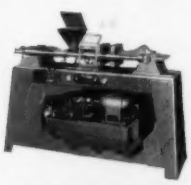
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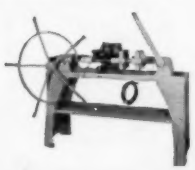
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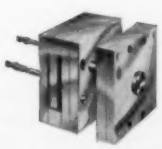
POWER OPERATED, LEVER CONTROLLED PRESSES
2-oz. and 1-oz. models



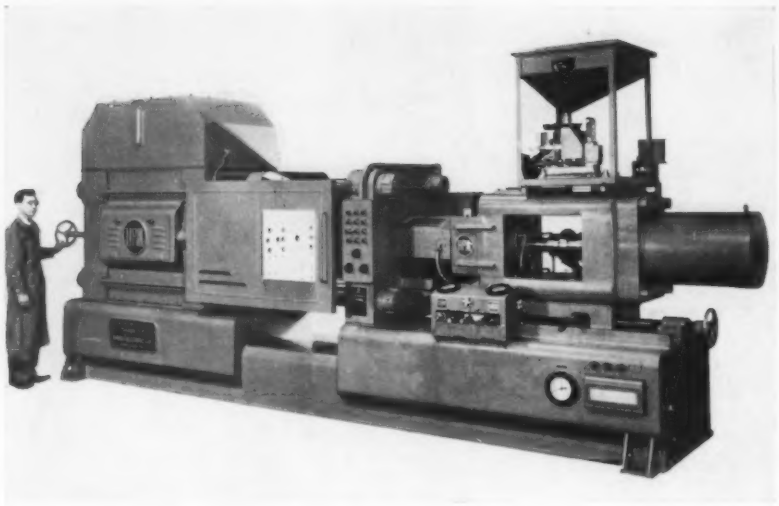
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1-oz. For small jobs, training, etc.



PLASTIC GRINDER
Grinds up rejects, waste, etc., for re-use.



MOLD BASES
Available from stock.



H-P-M's 20/28-oz. injection machine incorporates automatic weigh-feeding device

lically loaded, and a positive sprue break can be used at the option of the operator. A dual injection pump allows two-speed or dual-pressure injection. A straight-line hydraulic mold clamp provides for fast closing and opening speeds with automatic adjustable slow-downs prior to mold contact, at mold break-away, and during ejection. The plasticizing chamber has three pyrometer-controlled heating zones. Heating bands are mounted directly on the spreader. A ram spacer permits use of thin molds without use of bolsters. The oil tank is overhead-mounted, valves are mounted on manifold subplate. *The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.*

Hopper Accessory—When rejected plastics products that have iron or steel components are reground, it is not unusual for some of these metal parts to show up in the reprocessed molding material, contaminating the material and causing damage to the injection machine.

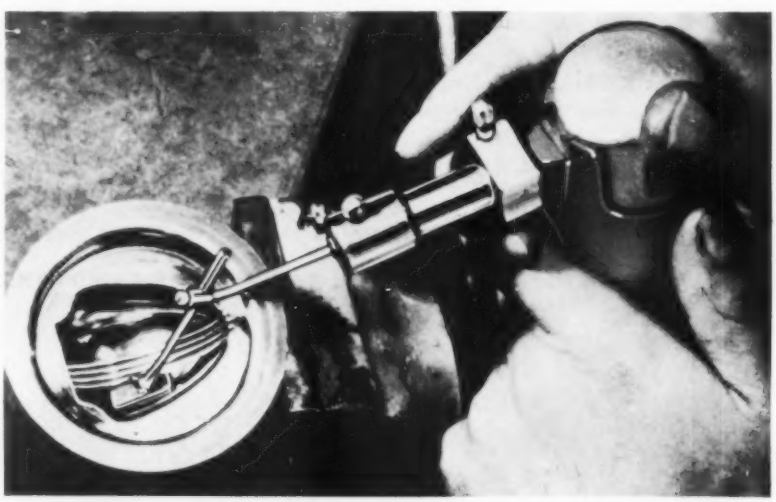
Model P grate, designed for use in hoppers of machines handling such material, was developed to eliminate these dangers. The unit consists of a series of stainless steel tubes which cover Alnico magnetic elements, spaced and held in position by welded stainless steel strips. Parallel with the magnetic tubes and centered between them, are ½-in. sq. steel grid bars which are also welded to the strips. The unit is installed by simply placing the grate in the hopper, with the ends of the tubes resting against the sides. In operation, the grid bars act as baffles to deflect material onto the magnetic tubes where all iron contamination is firmly held, while the cleaned molding material continues through the hopper. Maintenance consists of lifting the unit out of the hopper and wiping it clean of ferrous accumulation. *Eriez Mfg. Co., Erie, Pa.*

Profiling Instrument—Model FNC Di-Profiler is a reciprocating hand machine for cutting, roughing, and finishing during die and tool making, precision fitting, and tool maintenance operations. It can be used with any suitable flexible drive and without an intermediary sleeve coupling. Speed of reciprocation is adjustable from 0 to 100 strokes/sec., and controlled stroke is variable from 0 to 6 mm. (¼ inch). Accessories include cutters, files, disks, points, burrs, laps, scrapers, and rectangular and disk hones and laps already mounted on shoes. Two angle extension rods permit finishing corners, grooves, fine contours, and other difficult areas. Weight is less than one pound. *Engis Equipment Co., 431 South Dearborn St., Chicago 5, Ill.*

Pneumatic Vibrators — Muffler-equipped, noiseless-type ⅝- and ¾-in. pneumatic vibrators are said to reduce processing time by vibrating small bins, chutes, hoppers, and screens to prevent arching, clogging, or sticking of inert bulk materials without the usual noise of impacting type vibrators.

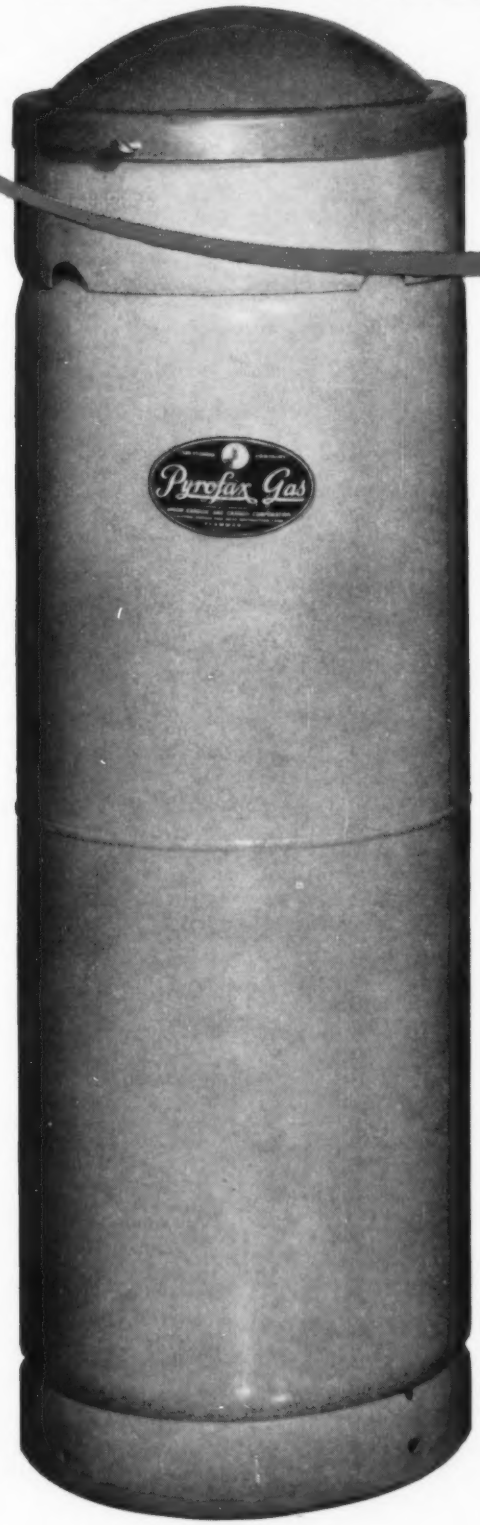
Vibrating action is achieved by a piston which is caused to reciprocate in a cylindrical passage by introducing compressed air alternately to the opposite ends of the cylinder. It is designed to deliver up to 5000 strokes/min., and to operate on 30 to 140 p.s.i. line pressure. Vibrator is 6¾ in. long and weighs 2½ pounds. *Burgess-Sterbentz Corp., 3790 W. 150th St., Cleveland 11, Ohio.*

Teflon Extruder—Teflon rod from ¼ to 2½ in. O.D., and tubing from 1 to 2 in. I.D. can be continuously and automatically produced on Model TRE-1 extruder. The unit meters cold Teflon powder to a die chamber where it is compressed by



Engis Equipment's reciprocating profiler has controlled stroke variable from 0 to ¼ inch

SMOKE, SUN, SALT LADEN AIR WON'T HURT THESE REINFORCED PLASTIC DOMES



Protecting the valves and tops of these Pyrofax gas cylinders from snow, water, and falling objects is a year-round job.

That's why these detachable domes are molded from reinforced plastics made from glass fibers and BAKELITE Polyester Resins. They're lightweight, tough, strong, and are resistant to corrosive atmospheres, moisture, and salt laden air. No coatings are needed. They are included in the operating equipment approved by Underwriters' Laboratories.

Production is easy with reinforced plastics made of BAKELITE Polyester Resins and glass fibers, bringing lower costs in many cases. Moldings as large as auto bodies and aircraft radomes are being made from these same materials.

Bakelite Company is the one source that supplies a variety of polyester resins, as well as epoxies, phenolics, and epoxy-phenolics for reinforced plastics. It can also help make your application a success through its vast technical resources and years of experience in working with plastics. To learn how much this can mean, write Dept. ZC-13, stating your problem.

"Pyrofax" is a registered trade-mark of Pyrofax Gas Corp., a Unit of Union Carbide and Carbon Corporation.

Covers molded by Molded Fiber Glass Co., Ashtabula, Ohio, and Woodall Industries, Inc., Detroit 34, Mich.

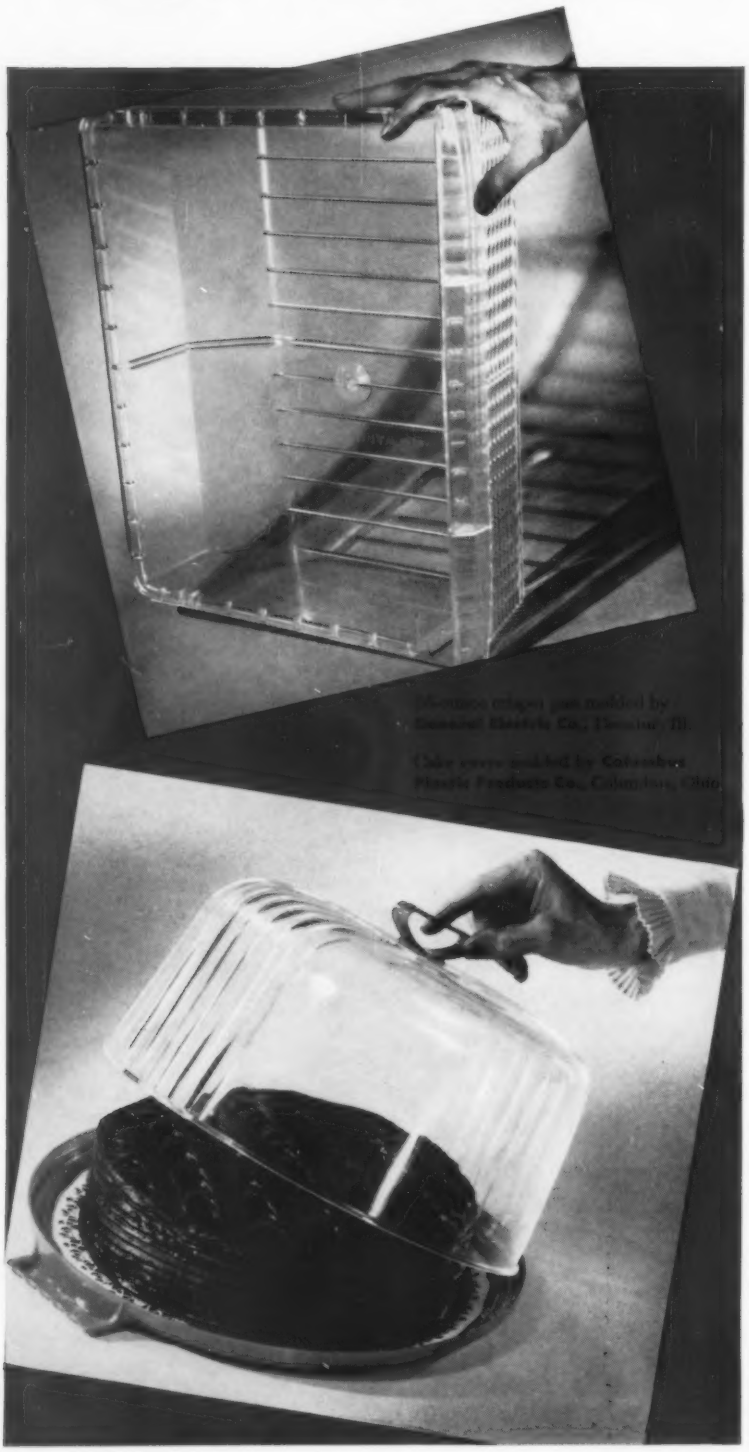
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These big, glossy-surfaced, crystal-clear moldings show what can be done with a new general-purpose styrene molding material—BAKELITE SMD-3500.

The high plasticity of SMD-3500 permits it to fill more cavities within the same cycle needed for ordinary polystyrenes. Production time for the refrigerator crisper tray was cut 25 per cent with SMD-3500. Although cycles are fast, pieces are remarkably free from stress crazing and weld lines, as the cake cover shows. SMD-3500 can be used on all types of injection molding machines.

Another new BAKELITE Styrene molding material – SMD-3000 – is notable for its resistance to high heat distortion. Like SMD-3500, it is produced on specially-designed, automatic equipment to ensure uniformity of color and molding properties. An advanced system of quality control is constantly in effect. The same Bakelite Company technical resources that developed these new materials are at your service in applying them to your products. For detailed information, write Dept. YR-13.

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a reciprocating, pneumatically operated ram. The compressed powder is then sintered, partially cooled, and extruded as a continuous tube or rod, depending upon the die used. The metering conveyor and ram can be selectively timed and controlled to meet particular product requirements. *Jennings Engineering, Inc., 3452 Ludlow St., Philadelphia 4, Pa.*

Test Equipment—A fully automatic Rockwell Hardness tester, working on the same principle as the hand-operated unit, can perform between 1000 and 1200 tests per hr., according to the manufacturer. Manual testers average between 200 to 400 tests per hour.

With automatic operation, pieces being tested are power-fed into the tester and automatically placed in position beneath a diamond penetrator. Testing loads which force the diamond into the material to determine its hardness are applied and removed, and the hardness of the piece is indicated on a dial.

The unit includes a control which regulates the up and down travel of the elevating screw, making it unnecessary to have pieces all of the same thickness for automatic testing. *American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn.*

Hydraulic Press—Designed for use by printers, electrotypers, stereotypers, plastics and rubber plate makers, and for laminators, this hydraulic press has individually controlled hot and cold platens, one-level operation, and electrically heated platens thermostatically controlled. Size of platens depends on customer's requirements.

When used for producing electrotype molds, the hot press is pressure-activated to force plastic into pattern, followed by cold pressing to hold and solidify the mold. For the production of printing plates, a plastic sheet is molded into a matrix in the hot press, then cooled under pressure. *Studebaker Machine Co., 1221 S. 9th Ave., Maywood, Ill.*

Trimming Tool—Open type steel dies that can be designed for either single or multiple cavity trimming of vacuum formed pieces require only a punch press for operation. They are self-centering and self-locating and have built-in air equipment that



Cutting Die Institute's trimming tool is used in finishing vacuum formed pieces

expels the plastic part after trimming. These tools, engineered especially for trimming of three-dimensional objects, are claimed to be inexpensive to manufacture, quick to produce, and to eliminate hand-trimming, edge polishing, and deburring. *Cutting Die Institute, 1643 National Bank Bldg., Detroit 26, Mich.*

Mill Accessory—Hydraulic roll-setting device is claimed to guarantee consistent and uniform mill production, even when operated by unskilled personnel. With regular hydraulic systems, a leakage problem exists around the adjusting piston. This leakage necessitates frequent pressure adjustments to maintain the correct roll setting.

The Hydra-Set roll-setting device is said to preclude this leakage by sealing the pressure chamber with a synthetic rubber diaphragm. Force is transmitted through the diaphragm to the piston, which in turn controls the roll position. Since there is no leakage past the diaphragm, pressure is constant, and the roll setting remains at its correct position.

The complete Hydra-Set installation includes cylinders, pumps, gages, and safety rupture disks on back roll cylinders. It is available as optional equipment on new mills or as a field conversion kit. *J. H. Day Co., Inc., 1151 Harrison Ave., Cincinnati 22, Ohio.*

Cutter—Completely automatic, the Kolbus Cloth Cutter is designed for slitting and sheeting rolled material on a production basis. The unit can be used as a sheeter by separating the slitting knives; as a slitter by disengaging the cutting knives and making another minor adjustment; and as a slitter-sheeter. The machine will handle material up to 56 in. in width and has a maximum cut-off of 36 inches. Feed is adjustable for any length up to the maximum.

In operation, the roll of material to be cut unwinds and passes through the circular slitters and cut-off knives which shear it into rectangular pieces at the rate of 15 to 36 cuts per minute. Excess material is automatically rewound and does not pass the cut-off knives. *Printing Industries Equipment, Inc., 135 W. 20th St., New York 11, N. Y.*

Indicating Controller—Series 400 controller finds application in molding and extruding operations, heat treating furnaces, ovens, etc.

The unit is a direct-deflection indicating controller. The heart of the measuring circuit consists essentially of a d'Arsonval galvanometer of high sensitivity. In addition, the circuitry consists of one manganin calibrating resistor, one copper coefficient compensating resistor, and one bi-metallic reference junction compensator. A grid cathode oscillator is used as a means of translating process requirements (as measured by the indicator) to whatever control action may be demanded to keep the process at optimum condition or on the control point.

The unit comes in a two-compartment case, designed for either surface or flush mounting. The upper section contains the plug-in type measuring and indicating system,

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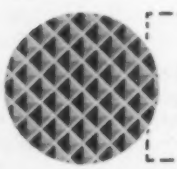
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the lower part the plug-in type control chassis. *Barber-Colman Co., Wheelco Instruments Div., Rockford, Ill.*

Weigh-Feeder—Intended for use with all types of free-flowing materials, a net weighing machine with load discharge timer and counter is available in capacities from a few oz. to 25 lb., with dial and beam calibrations in either metric or avoirdupois.

Material is fed into the unit by a vibratory feeder until the predetermined amount is in a weigh bucket. The bucket will discharge its content when a preset time interval has elapsed. A counter unit records the number of weighings and shuts off the operation when a preset number of loads has been handled. Visual indication of each weighment is provided for. The scale has a one-to-one balanced lever. Control rheostats provide infinite adjustment of both fast and slow rate of feed to weigh bucket. *The Exact Weight Scale Co., Columbus 8, Ohio.*

Painting Machine—This line of automatic spray mask painting machines is engineered for application in three-dimensional finishing operations. The spray itself is concealed within the machine. The flow of air across the passage of spray, plus the ventilating and ducting system used with the equipment, is claimed to prevent escape of fumes into the work room or their deposition on the guns and other mechanisms.



Sepanski's automatic spray mask painting machine is designed for application in three-dimensional work

Amount of finishing material, speed of travel, and spray gun pattern are pneumatically and hydraulically controlled. Four angular spray patterns per cycle are available.

Length of stroke, width of spray, and angles of application are controlled by simple adjustments. Lubrication is automatic from one supply source, and automatic timers control cycling.

Three standard models are available: Model 1200 has a 12-in. stroke, Model 1800 has an 18-in. stroke, and Model 2400 has a 24-in. stroke. *Sepanski & Associates, 900 Clancy N. E., Grand Rapids 5, Mich.*

Calender—Inverted "L," four-roll plastics calender, with separate pinion stand and roll-crossing equipment for crown compensation, is a 24- by 68-in. unit equipped with six roll-adjusting-screw motors, circulating oil lubricating system, four peripherally-drilled rolls, metal labyrinth seals, and full-circle bronze sleeve-type bearings. The main calender drive motor can be mounted between the pinion stand and the calender for space conservation. The calender is designed to operate at a top speed of 80 yd./min., with a 200-hp. d.c. drive motor. *Adamson United Co., Akron, Ohio.*

Compressor—Driven by a direct-connected induction motor, air compressor Model PHE is a packaged, ready-to-run unit which can be used in single or multiple stages. Basic design is a two-stage unit for 80 to 125 p.s.i.

Piston and rod assemblies of equal weight, moving in opposite directions on a 180° crank, balance out all primary and secondary inertia forces without the use of counterweights. Crossheads are of the aluminum piston type. Valves are of the "A" series channel type. Crankcase is sealed, and a direct-driven lubrication pump supplies all moving parts with oil. Two-stage compression and a water-through-tube-type intercooler are said to reduce horsepower requirements. *Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.*

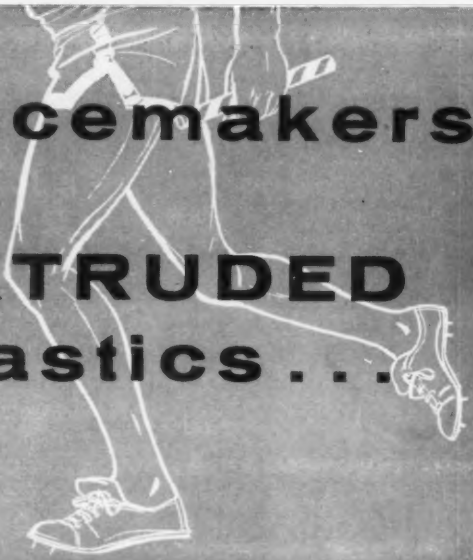
Temperature Control—Model 6012 single-temperature control unit has adjustable, fast-acting, automatic heating control, and modulating cooling control. It is designed for



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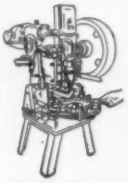
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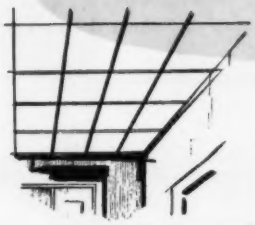
Sterling's single-temperature control finds application in injection molding, vacuum forming, and calendering

injection molding operations where a single stabilized temperature is adequate (e.g. for some small molds or molds with shallow cavities). It also finds application in vacuum forming where metal molds have provision for water circulation, and in calendering, where it functions to keep roll temperature at the proper operating level.

The unit normally operates vertically, but is designed so it can operate with equal efficiency in various horizontal positions. The control equipment may be combined with dual units produced by the same company for applications where two or more temperatures are to be regulated. *Sterling, Inc., 3738 N. Holton St., Milwaukee, Wisconsin.*

Slitting Equipment—Model 500, a multi-purpose slitting and roll winding machine, has provisions for either shear cut, score cut, or razor-type slittings. The unit runs at speeds up to 2000 ft./min., and can be built to trim parent rolls up to 62 in. wide. It has a rewind capacity of 20-in. diameter, and can be equipped with a built-in constant-tension and electric side register control. *Cameron Machine Co., 61 Poplar St., Brooklyn 1, N. Y.*

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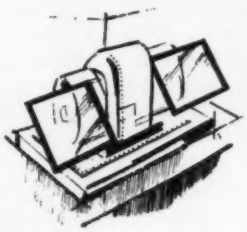
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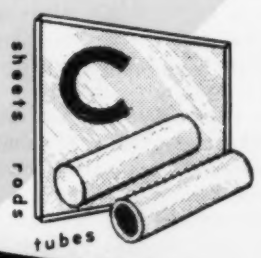
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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Plastics Engineering Handbook of The Society of the Plastics Industry, Inc."

Published in 1954 by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 813 pages. Price: $15.00

With the publication of the second edition of the Plastics Engineering Handbook of The Society of the Plastics Industry, plastics literature has reached a major landmark. Completely revised since the first edition appeared in 1947, and about doubled in size, the current volume constitutes a well organized and effectively complete summarization of the present state of engineering knowledge in the plastics field.

The handbook is the result of work done by over 20 P.S.I. committees, comprised of men actively engaged in the various phases of plastics engineering. As a consequence, the volume is not only encompassing in its scope, but also authoritative in its data; not a theoretical treatise, but a combination of theory and practical experience gained over long-term associations with all phases of the plastics industry.

The handbook is divided into three sections: Materials and Processes, Design, and Finishing and Assembly. Each section, in turn, is made up of chapters dealing with specific phases of the over-all subject. For example, the section on materials and processes contains such topics as molding; preforming, drying, and preheating; extrusion and extrusion machines; forming, drawing, and post-forming; reinforced plastics; casting; tooling; embedding; etc., etc. Wherever applicable, step-by-step procedures, formulas for the determination of a variety of values, trouble-shooting information, and similar specific information is provided.

Of special note is an adhesives reference chart, listing in convenient form adhesives to be used for bonding metals, thermoplastics, thermosets, rubbers, cork, plaster, and wood. Lists of standards, a classification of rigid molding materials, and a well organized index, all contribute to the value of the book. The materials supplier, designer, molder, fabricator, finisher, and user of plastics will find this handbook an invaluable reference guide.

"Adhesive Bonding of Metals," by George Epstein

Published in 1954 by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 218 pages. Price: $2.95.

Aim of this book is to provide the engineer or technician who is faced with the problem of joining two materials, with sufficiently detailed information to enable him to determine if an adhesive-bonded joint would be advantageous, what type of adhesive to select, how to use the adhesive, and how to design the joint for optimum performance. The author, research engineer at North American Aviation, discusses the basic materials for adhesives (thermosetting, thermoplastics, and elastomeric resins) and gives typical adhesives formulations. A special chapter deals with adhesives for metals in sandwich construction.

"Fiberglas Reinforced Plastics," by Ralph H. Sonneborn, et al.

Published in 1954 by the Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 240 pages. Price: $4.50.

One of the characteristics of a new art or industry is that many years of practical experience and progress pass before a systematized body of knowledge can be collected. The reinforced plastics industry has now been growing apace for 10 years, experimenting with materials, production methods, design potentials, and the like, without the benefit of a compendium of the knowledge available on the subject, conducting much of the work on a trial-and-error basis. This situation has now been remedied with the publication of the present volume.

Designed to be a reference guide to those well versed in the subject and a general text to those who wish to become acquainted with reinforced plastics, the work represents the first effort to consolidate the knowledge accumulated by the reinforced plastics industry over the short span of its meteoric development.

Following an introductory chapter, the subjects of materials and processing are discussed; the discussion is descriptive and evaluative, rather than of the how-to-do-it type. A chapter on properties is also primarily a discussion, although a considerable amount of data is presented. At times it is qualitative, mainly because there are many quantitative data in the industry which have not yet been evaluated.

Because the subject of design in reinforced plastics is relatively new, three separate discussions are presented, each from a different viewpoint.

Plasticizers—The revised edition of this plasticizer catalog contains descriptions and specifications of a complete line of monomeric and polymeric plasticizers. The catalog presents performance data, including an appraisal of such factors as low-temperature flexibility, volatility, water extraction, oil extraction, heat stability, and light stability. *Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio.*

Vacuum forming—Stated purpose of this brochure is to inform current and potential industrial users of metallized vacuum-formed products of the preferred techniques and materials presently used in vacuum forming. The brochure discusses the vacuum forming process, presents a comparison between metallized acetate and butyrate, and deals with such topics as uses of metallized plastics, materials and colors that are available, printing and preprinting methods currently in use, and types of molds employed in vacuum forming. *Coating Products Co., 101 W. Forest Ave., Englewood, N. J.*

Epoxy adhesives—Formulations and properties of a line of adhesives based on liquid polymer-epoxy combinations are presented in this 14-page booklet. Application information is also provided, including surface preparation (glass, aluminum,

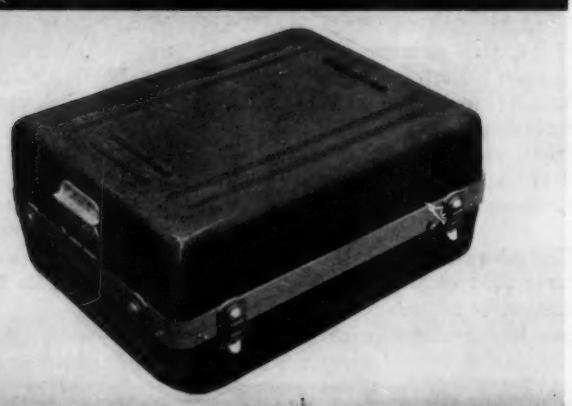
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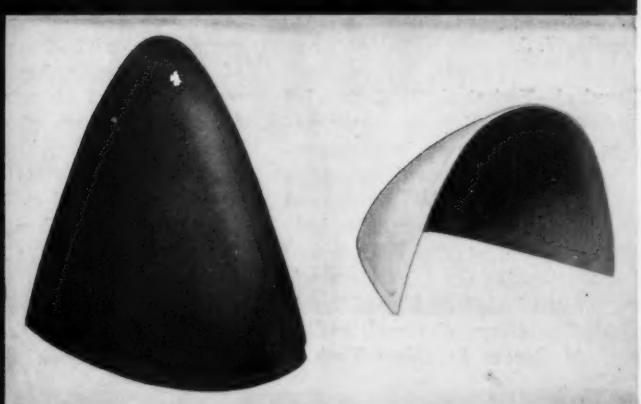
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steel, copper alloys, rubber, wood, and plastics), mixing, application. and curing. The booklet also lists a number of advantages claimed for these adhesives which are said to be unobtainable with other formulations. *Thiokol Chemical Corp., Trenton 7, N. J.*

Production facilities—This four-page folder announces the entry into the custom vacuum forming field of a company long established in injection and compression molding. Its injection machines range from 2 to 48 oz., and its compression presses go up to 400-ton capacity. Its vacuum forming equipment can handle all customary materials in sheet sizes up to 42 by 72 inches. *The Vlchek Tool Co., 3001 E. 87th St., Cleveland 4, Ohio.*

Control panels—Bulletin 0254 pictures 27 typical control panels for use with weighing and materials handling systems, motor controls, machine tools, and plant processes, and lists the names of the companies for whom the panels were engineered. Among the applications included are chemical, plastics, and food processing operations. *Richardson Scale Co., Van Houten Ave., Clifton, N. J.*

Industrial rolls—Steps in the manufacture of industrial rolls (embossing, printing, etc.) for use in packaging, plastics, paper etc., are described in this 16-page booklet. Included is information on quality control checks, inspection procedures, and design characteristics. *Paper Machinery & Research, Inc., Roselle, N. J.*

Chemical—Technical Bulletin I-4 presents information on napthoquinone, suggested for use in the manufacture of synthetic rubber, polyester resins, fungicidal sprays, and other chemical syntheses. The bulletin lists characteristics by use of structural equations. Literature references are included. *Allied Chemical & Dye Corp., National Aniline Div., 40 Rector St., New York 6, N. Y.*

Conveyor belting—Catalog 2640 describes properties and uses of vinyl conveyor belts for light industrial use and food handling under conditions where resistance to oils, mild acids, and alkaline and neutral salts is important. The belts find applications in handling nuts, meats, greasy pans, cookies, and similar products where processing temperatures range from 50 to 150° F. The catalog also lists a line of rubber conveyor belts for food handling and light industrial use. *The B. F. Goodrich Co., Industrial Products Div., Akron, Ohio.*

Silica aerogel—Used as thickening agents for greases and printing inks, flatting for surface coatings, mold lubricants, dry grinding agent for DDT, anti-caking and bulking agents, reinforcing filler for silicone rubber, and as thickener for polyester and epoxy resins in low-pressure molding, a line of silica aerogels, tradenamed Santocel, is described in this booklet. *Monsanto Chemical Co., Inorganic Chemicals Div., 710 N. Twelfth St., St. Louis 1, Mo.*

Impregnated wood—Profit possibilities in products molded from granulated wood impregnated with synthetic resin binders, are outlined in a booklet entitled "Multiply Profits." Raw materials, equipment, and fields of application are descibed. The latter include housewares, furniture, packaging, electrical parts, sporting equipment, toys and novelties, appliances, personal accessories, and industrial equipment. A flow chart of the manufacturing process for impregnated wood waste is included. *Monsanto Chemical Co., Plastics Div., Springfield, Mass.*

Reinforced plastics—Entitled "Futures Unlimited," a 16-mm. color and sound industrial film depicts some of the processes involved in the manufacture of fibrous glass reinforced plastics structural elements in aircraft, furniture, and electronic applications. Requests for showing should be directed to *Public Relations Director, Libbey-Owens-Ford Glass Co., Fiber Glass Div., Toledo, Ohio.*

Molding problems—"Leaves from a Moulder's Notebook" is a 38-page brochure which, based on actual production experience, discusses in detail the solution to a variety of molding problems. Some of the difficulties reported are shrinkage and distortion in transfer molding, frictional heating, flow marks, insulation by water flow, ribs and air vents, molded hinges, pins, flash, and others; means of overcoming these problems are cited. *British Industrial Plastics Ltd., 1 Argyll St., London W. 1, England.*

Polyester-glass—Presented in tabular form, a "Trouble Shooter's Guide to Polyester Molding," published in issue No. 11 of *Resin Review,* deals with such problems as blisters, crazing, odor, pitting prominent fiber patterns, resin-starved areas, resin-rich areas, voids, warping, and washing of preforms. It describes each defect, lists possible causes, and outlines suggested remedies. *Rohm & Haas Co., Resinous Products Div., Philadelphia 5, Pa.*

Chemicals—Information on physical and chemical properties and suggested applications for a group of chemicals is presented in four New Product Information bulletins. The chemicals described are: 1) ethylene bis (glycolic acid), suggested for the preparation of polyamides, polyesters, plasticizers, synthetic lubricants, and adhesives; 2) isocinchomeronic acid, suggested as an intermediate in the preparation of plasticizers, dyestuffs, pigments, polyesters, insecticides, and pharmaceuticals; 3) pyromellitic acid, for applications in the polymer and resin industries; and 4) nitrocyclohexane, a solvent for such substances as waxes, resins, natural and synthetic elastomers, and many organic chemicals. *E. I. du Pont de Nemours & Co., Inc., Explosives Dept., Wilmington 98, Del.*

Engineering services—Product development research, process development, equipment design, plant operation, production trouble shooting, and cost analysis, are some of the engineering services which are offered in this 12-page booklet. *Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y.*

Pipe accessories—A line of pipe accessories is outlined in this 2-page product sheet. Included are needle and globe valves of unplasticized P.V.C.; nuts and bolts of Boltaron 6200; and Fluoroseal pipe compound (suitable for plastics as well as metal pipe). Also listed are pails, dippers, and pitchers, made of Bolta-

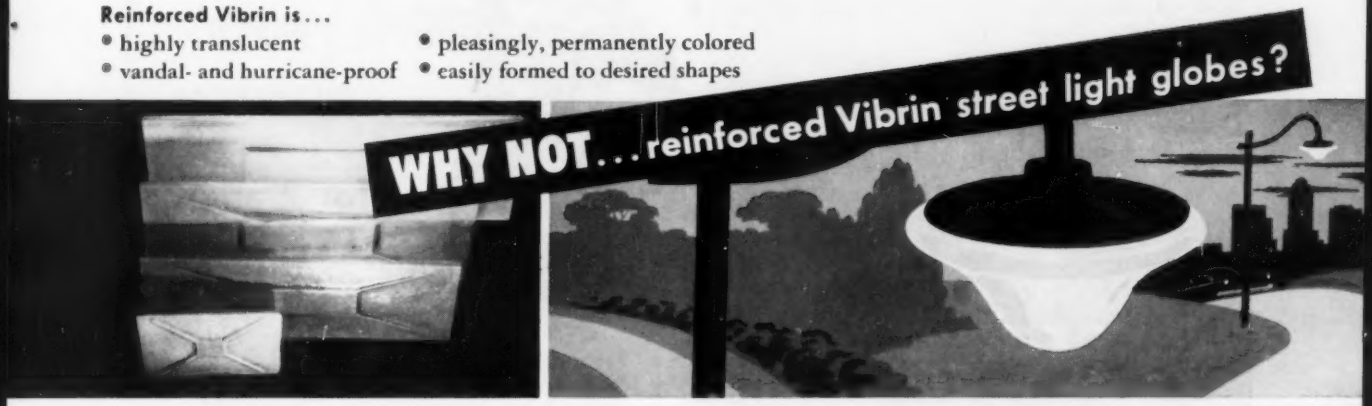
(*To page* 191)

HERE'S WHY REINFORCED VIBRIN®

...is now used for *window panels*

Reinforced Vibrin is...

- highly translucent
- vandal- and hurricane-proof
- pleasingly, permanently colored
- easily formed to desired shapes



...refrigerated truck doors

Reinforced Vibrin is...

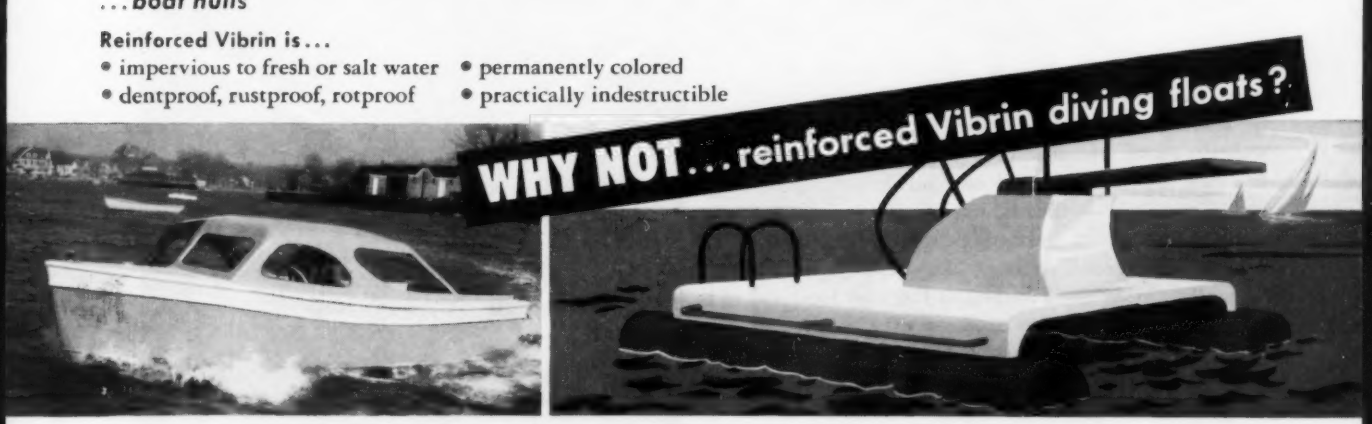
- lighter than aluminum
- weather-resistant
- easily steam-cleaned
- non-warping, highly insulative



...boat hulls

Reinforced Vibrin is...

- impervious to fresh or salt water
- dentproof, rustproof, rotproof
- permanently colored
- practically indestructible



Why not Vibrin for the thousands and thousands of products and applications that have long awaited just the properties this versatile polyester offers? Let us know of your plans or problems and see what Vibrin can do for *you.*

50TH ANNIVERSARY 1904 1954 NAUGATUCK CHEMICAL

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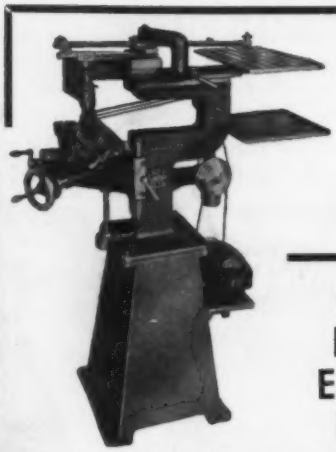


When the Lawrence Process Company of Lawrence, Mass. started producing vinyl welting, shoes made by leading manufacturers were sure of the longer weather-proof life that only this versatile plastic can produce. But with the new surface decorating was a problem — that is, until Swift technicians stepped in with an embossing tape that was moisture-proof and scuff resistant like the vinyl surface — while adding *good looks* and *low cost* for good measure . . . one more example of a Swift Foil *formulated to meet an unusual requirement.* Find out more about Swift Foils today . . . send us a sample of your plastic surface; it will be stamped and returned for your inspection without obligation.

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moldmakers agree

ELGIN DIAMOND

assures finer, faster mold finishing!

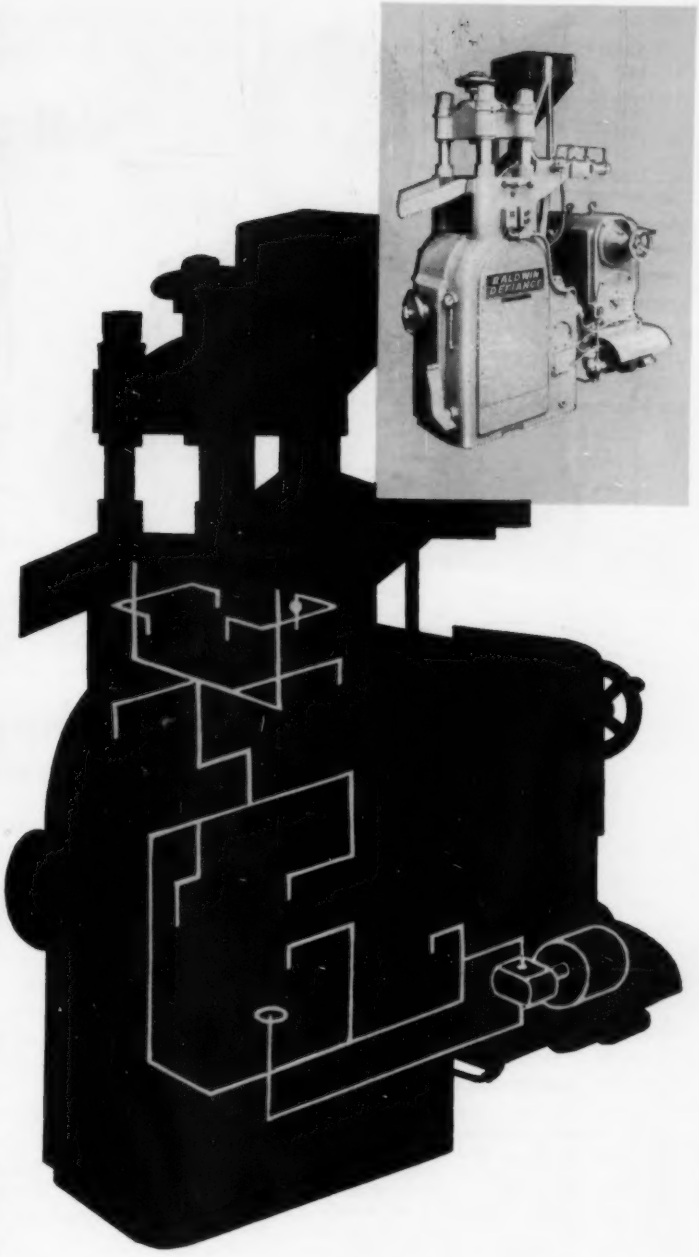
The above illustration shows how Elgin Diamond is used at Kurz-Kasch, Inc. . . . leading Dayton, Ohio plastic molder. It's only one of the many places Elgin Diamond proves itself to give higher quality, lower cost finishing. With Elgin Diamond you can count on consistent polishing results—maximum cutting speeds. Remember, to save time and money the safe way . . . use Elgin Diamond.



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ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

BALDWIN plastics presses reduce downtime with *SAFEGUARD LUBRICATION*



Baldwin's safeguard lubricating system is just one of the many practical features designed to benefit the user of Baldwin presses for molding and preforming plastics. Here's how it works in Models 20 and 45:

An independently driven oil pump is electrically interlocked with the press motor. This interlocking prevents operation of the press unless lubricant has reached the moving parts of the system. The result is absolute protection against loss of lubrication in moving parts.

This single feature of the Baldwin Models 20 and 45 pays daily dividends in terms of less downtime. Like the many other practical advantages of Baldwin plastics presses, it has been proved in performance by user after user.

You can't afford to overlook the many outstanding features of Baldwin plastics preforming and molding presses. Why not send today for your copy of Bulletin #3103 containing detailed information? Address Department 4326, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

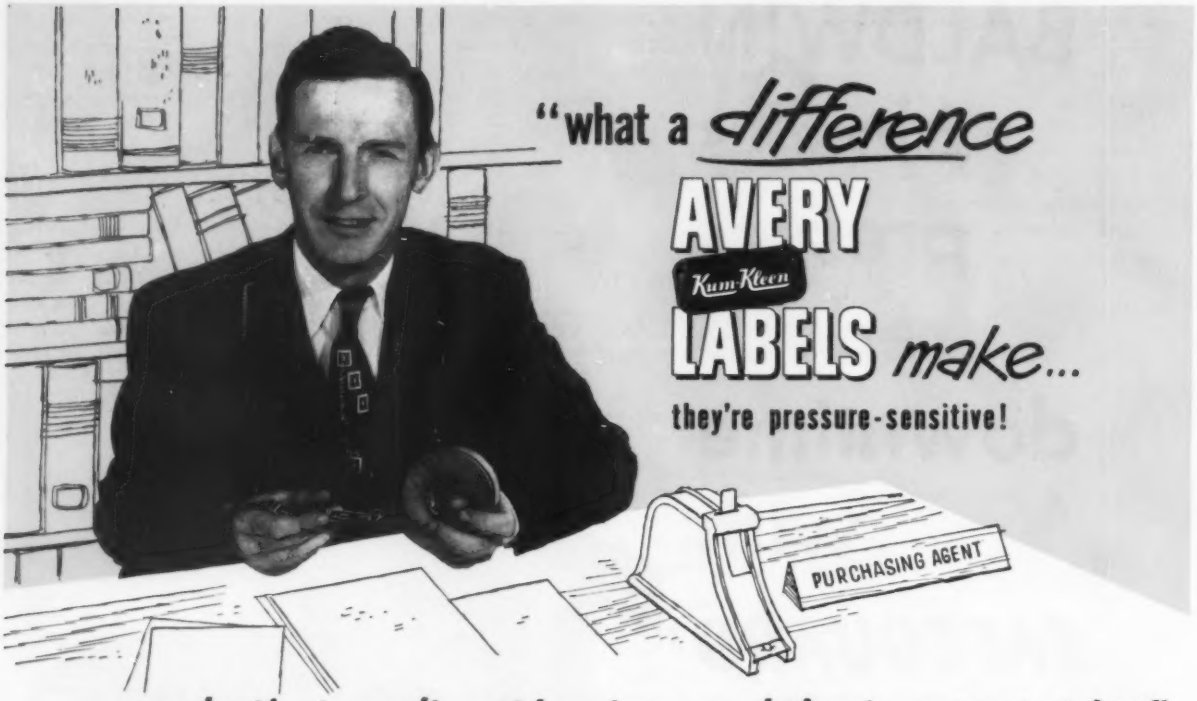
Exclusive Features of BALDWIN PLASTICS PRESSES

Safeguard lubrication reduces downtime.
Balanced pressure cuts vibration for longer die set life.
Simple adjustments allow weight-density changes during operation.
Cam controlled feeder assures uniform tablet weights.
Cleanline design prevents contamination, speeds cleaning.

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BALDWIN-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. • Offices in Principal Cities



...production's really sold on 'em—and they're priced right!"

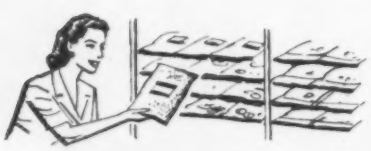
Plant... department... or individual—everyone's sold on Avery Pressure-Sensitive Labeling. Here's why:

■ *Countless hand operations are eliminated*...one simple motion and they're on to stay—*without moistening!* Avery Kum-Kleen Labels are fed, either one-at-a-time from an automatic dispenser, or from sheets for individual labeling.

■ *Production line speed* means Avery Labels work on every labeling job faster, more efficiently and more economically. They fit into any production line, at any speed.

■ *Clean, easy application* even on hard-to-label surfaces. Self-Adhesive Avery Kum-Kleen Labels stick tight to any clean, smooth surface...they won't dry out, curl or pop off. And they stay neat and attractive—even under temperature and humidity extremes.

■ *Low cost Avery Dispensers*—either manual or electric—assure dependable labeling and top efficiency for every labeling job. Write today for details—case histories and free samples of Avery Pressure-Sensitive Labeling!



SPECIFICALLY SPEAKING...

One large California packing house decided on a sturdy plastic bag to package their dried fruit products. But they also wanted a package that was different...something more distinctive than the ordinary printed end-closure. That's when Avery was called in. Result: a newly-designed label in the center of the bag...an interesting package design with sales appeal, and a label that was quickly seen and read. Of course, Avery labels stick to the pliable plastic bag without popping off, and what's more, a method was devised to automatically affix Avery Labels during the bag making process for even greater speed and economy! What's your labeling problem?

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Avery labeling specialists, experienced with the requirements and labeling problems of many industries, are at your service to help you develop improved, low-cost self-adhesive labeling methods. No obligation...write today!

AVERY Kum-Kleen LABELS

ron 6200 and 7200, for handling of corrosive materials. *Industrial Plastic Fabricators, Endicott St., Norwood, Mass.*

Printed circuitry—Information on two electrical grade, paper-base phenolic-copper laminates for use in printed circuits is given in this 4-page bulletin. Electrical characteristics, physical properties, bond strength, punching information, and sheet sizes and thicknesses are given. *The Richardson Co., 2661 Lake St., Melrose Park, Ill.*

Resins—Characteristics and applications of 14 resins (vinyl and styrene) are briefly outlined in this 20-page brochure. Some of the applications include: production of plastic printing inks; phonograph records; paints, varnishes, and other protective and decorative coatings; and wire insulation. *Firestone Plastics Co., Chemical Sales Div., Pottstown, Pa.*

Tooling—Services and facilities offered for tool design, templet layout, templet reproduction, templet making, and fabrication of tools and fixtures are described in this 12-page booklet entitled "Templatooling." A special section on plastic tooling is included. *Template Reproduction & Engineering Co., 401 N. Broad St., Philadelphia, Pa.*

Industrial safety—Various phases of industrial safety are discussed in three booklets: "Safety Devices and Ideas" describes over 90 safety devices which have been tried and found effective in plant use. Most of them are not commercially available, having been thought up and constructed by operating plant personnel. "Two-Wheel Hand Trucks" outlines the proper maintenance and use of two-wheel hand trucks. "What's in It For Me?" shows that everyone gains from a good safety program, stressing the theme that no one is immune to accidents if he is not careful. For information on prices write *National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.*

Glass yarns—Specifications for a complete series of textile glass yarns is contained in this folder. Yarns range from a single strand running 88,200 yd./lb., to a 4-strand 8-ply yarn of 450 yd./pound. All yarns listed have a tensile strength of 250,000 p.s.i. or higher. *Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo 3, Ohio.*

Vacuum forming—A line of plastics sheets for use in the vacuum forming process is presented in this four-page folder. The materials covered include: high-impact styrene copolymer, rigid and flexible vinyl, cellulose acetate, polyethylene, and polyvinyl chloride acetate. *Societa Italiana della Celluloide, Castiglione Olona (Varese), Italy.*

Research tools—Examples of research accomplishments possible through the use of X-ray analysis instruments are provided in two folders which show actual charts made on such instruments. Samples of Illium and Samarskite were analyzed for elements on the X-ray Spectograph, samples of $C_{28}H_{56}$ and Albite-microcline were analyzed on the X-ray Differactometer. *North American Philips Co., Inc., Research & Control Instruments Div., 750 S. Fulton St., Mt. Vernon, N. Y.*

Ovens—This catalog presents a line of laboratory and industrial ovens. The laboratory models include gravity convection ovens, forced-draft ovens, high-temperature ovens, and mechanical convection ovens; plant models include larger, batch-type units. *Schaar & Co., 754 W. Lexington St., Chicago 7, Ill.*

Engineering service—This bulletin describes the services of a plant engineering company in readying complete plants for fractionation, absorption, extraction, distillation, and evaporation. The firm designs and supplies complete operating units, including major equipment and instrumentation, major auxiliaries, and the plans for equipment layout, structural steel, piping, and electric wiring. *Process Plants Engineering Co., 363 Bloomfield Ave., Montclair, N. J.*

Finishing equipment—Bulletin 1210 catalogs a complete line of blast cleaning and dust control equipment and accessories, including shell cleaning machines, descaling units, and special machines for blasting and peening operations. A section discussing the three basic blast types (centrifugal, air, and hydraulic) is included. The catalog is indexed by equipment, by type of blast, and by purpose. *Pangborn Corp., Hagerstown, Md.*

Plastics machinery—"Equipment for the Plastics Industry" is an eight-page catalog listing various machines for use by the plastics industry. Included are: spiral flow intensive mixers, mixer chambers, laboratory and production roll mills, compression and transfer molding presses, 3- and 4-roll calenders, and others. Sizes, capacities, and specifications are listed. *Stewart Bolling & Co., Inc., 3190 E. 65th St., Cleveland 27, Ohio.*

Shell molding—Brochure CDC-272, a 28-page handbook, describes the latest developments in shell molding and the benefits offered by this process to foundrymen and buyers of foundry products. Information on resins for shell molding, production techniques, and test methods are given. Case histories are included. *General Electric Co., Chemical Materials Dept., Pittsfield, Mass.*

Adhesive modifier—This technical bulletin gives property and application information on Vinsol resin, a hard, brittle, high-melting thermoplastic material derived from southern-pine wood which, when used as an adhesive modifier, is said to reduce adhesive cost without impairment of adhesive strength. The resin is suggested as a low-cost component of Buna-N and vinyl adhesives, as well as for adhesives based on styrene, phenol, urea-starch, cellulose, and polymerized oil. *Hercules Powder Co., Naval Stores Dept., Wilmington 99, Del.*

Steam traps—A line of five steam traps is described in this six-page folder. They include: thermostatic, liquid expansion, thermodynamic, float-thermodynamic, and camlift bucket types. Application information for each type is given. *Sarco Co., Inc. Empire State Bldg., New York 1, N. Y.*

Sales aid—This 44-page Retailers' Plastics Manual, published jointly by S.P.I. and M.C.S., contains comparative information on the 12 plastics materials most commonly encountered at the retail level. For each

IMPROVE

product appeal

product service

LOWER COSTS

with

FORMED PLASTIC PARTS



This 18 inch diameter Hopper was formed from a single sheet of plexiglas.

This 30" x 30" Coffer was formed from a methacrylate sheet.

Investigate the advantages of adapting low cost, versatile, production forming of plastic components for your products. Improved appearance, lighter weight, longer life and ease of cleaning are just a few of the many advantages that customers are realizing from a wide variety of parts formed by Curbell.

Let Curbell show you how to incorporate these advantages into your product with formed plastic components . . . no obligation of course.

In addition to forming, Curbell offers a complete plastic fabricating service for small or large unit production, in the following types of plastics:

Kel-F
Nylon
Vinylite
Royalite
Fiberglas
Silicone Glass
Teflon
Lucite
Acetate
Glass Melamine
Vulcanized Fiber
Laminated Phenolics
Plexiglass

CURBELL, INC.

767 Hertel Ave., Buffalo 7, N. Y.

plastic discussed, the manual outlines its special properties and advantages (selling points), how to care for it, and how to clean it, and lists various tradenames under which the particular plastic is sold. In addition, the brochure includes sections on qualities and sales features common to all plastics; plastics sales training programs for retail stores; plastics products demonstrations; sales aids provided by the plastics industry, such as quality standards, seals of approval, informative labeling, and a program of retail consumer information; glossary of plastics trade terms; directory of plastics tradenames; and list of manufacturers of plastics products. Limited quantities of the booklet are available, without charge, to retailers, distributors, designers, and others directly concerned with plastics merchandising. Selling price: 50¢. *The Society of the Plastics Industry, Inc., 67 W. 44th St., New York 36, N. Y.*

Plastics promotion — Available to plastics manufacturers and other interested groups, a 57-frame full-color film strip, entitled "Out of the Test Tube—Into the Home," pictures the characteristics of each basic plastic used in home furnishings and shows typical consumer products manufactured from the various plastics. The film describes methods of caring for plastics products. No specific brands or companies are mentioned. $10.00 prepaid. Free of charge with each order are 10 copies of "Plastics—Everything a Woman Could Ask For" and 10 reprints of the article entitled "Over 100 Plastics In This Room." *McCall's, 230 Park Ave., New York 17, New York.*

Printed circuitry—The whole subject of printed circuits is briefly outlined in this 12-page brochure. The following subjects are covered: what is a printed circuit, what are the advantages of printed circuitry, how to select the best laminate, circuit design, how to make printed circuits (photo-engraving, offset printing, silkscreen printing), circuit fabrication, soldering, and others. Also described is a complete line of post-formable high-pressure copper-clad laminates for use in the production of such circuitry. *The Formica Co., 4614 Spring Grove Ave., Cincinnati 25, Ohio.*

IMPROVE Heat and Light RESISTANCE

in Plastisols Organisols and Solutions with

BARCA-10

A solvent-free liquid stabilizer for the vinyl resins

The complete compatibility of BARCA-10 avoids oily surfaces and bleeding under ultra-violet light. High stabilizing capacity offers extremes in age resistance and color pigment life.

BARCA-10 acts as a true secondary plasticizer without lubricant value.

Because BARCA-10 is a liquid, low in volatiles, it can be added at any stage of the mixing process. Based on barium and cadmium, and free from lead and sulfur, BARCA-10 eliminates common sources of blackening, odor and toxicity.

Write for free illustrated BARCA-10 Bulletin.

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ALLEN Punch Press

1-Ton Power Bench Type.

$97.50 less Motor

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- Dependable
- Economical

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Order TODAY. Price $97.50 F.O.B., Clinton, Mo. (Includes Motor bracket, V-belt, motor pulley, less motor).

For light work—stamping, forming, riveting, etc.—metal, fiber or other material.

Overall height 17½" . . . Base size 8½"x8½" . . . Die bed 5½"x8½" . . . Ram face 1½"x3½" . . . Ram stroke ¾" . . . positive ¾" ram adjustment . . . sturdy, single pin, non-repeat hand lever clutch . . . V-belt drive . . . weight 105 lbs.

Requires only ¼ to ½ H.P. motor.

The machine of a thousand uses! Adequate for many types of work now done on large presses at greater expense.

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plain or plastisol covered handles

PMS offers to the Injection Molders the finest plastic gate cutter obtainable. Made by Utica Drop Forge & Tool Corp. it is precision built to give excellent cutting action and long service.

The finely ground blades are flat on the back to assure neat cut-off at the molded piece. An adjustable stop screw is provided to prevent over-lapping of the blades assuring longer life of the cutting edges. These cutters are opened by a tempered spring action.

To Be Used for Cutting Plastics Only

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6" regular	$3.65 pr.	$42.00 per dozen
6" with plastisol covered handles	$4.15 pr.	$47.00 per dozen
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Replacement springs	$ .30 ea.	$ 3.00 per dozen

Producers of fine colorants for all thermoplastics

PLASTIC MOLDERS SUPPLY CO., INC.

Main Office & Plant, PL. 4-3822 - 4-0608 — 74 South Avenue, Fanwood, N. J. — Worcester, Mass., Office WO. 5-1088

Prevent Tramp Metal from Scoring Calender Rolls

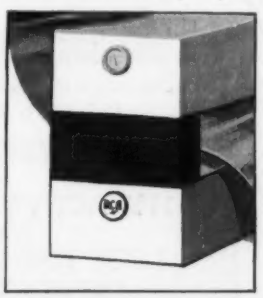


. . . with the RCA Metal Detector

If tramp metal is causing costly rejects and damaging expensive calendering and coating machinery, why not get the *positive* protection of the RCA Electronic Metal Detector?

Installed on your line, prior to calendering, the RCA Metal Detector will "see" dangerous imbedded metal particles. The detector can be set so that it permits metal in the pigment to pass, while detecting large tramp metal which might damage the equipment and delay production. It detects both magnetic and non-magnetic metals—even nickel, lead, brass and stainless steel.

When metal is detected, the RCA Metal Detector sounds an alarm and/or stops the conveyor. If desired, it actuates a solenoid valve which automatically rejects defective rolls.



Add up all the savings . . . you'll find that the RCA Metal Detector in your plant could pay for itself many times over in the course of a year. For installation and service you can depend on the RCA Service Company whatever your address. Use coupon for complete details.

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Dept. J-75, Building 15-1, Camden, N. J.
Please send me information on the RCA Electronic Metal Detector

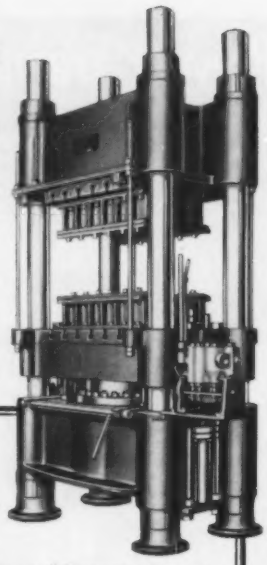
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PRESSES
Specially Designed for
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Single or Double Ram
Self-Contained or Central System
Complete line of Power and Pressure Pumps, Accumulators, Valves, Shock Alleviators

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LOW TEMPERATURE CATALYST FOR POLYESTER RESINS
WAREHOUSE STOCKS CONVENIENTLY LOCATED THROUGHOUT THE COUNTRY
®REGISTERED TRADE MARK
LUCIDOL DIVISION
WALLACE & TIERNAN INCORPORATED
BUFFALO 5, NEW YORK

Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION
From Statistics Compiled

Materials	*Total p'd'n. first 6 mos. 1954*	*Total sales first 6 mos. 1954*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester		
Sheets, under 0.003 gage	9,044,749	8,748,443
Sheets, 0.003 gage and over	5,816,095	5,931,030
All other sheets, rods, tubes	2,854,292	2,530,990
Molding, extrusion materials	35,149,003	34,399,245
Nitrocellulose sheets, rods, tubes	3,289,813	2,682,172
Other cellulose plastics	2,681,154	2,244,371
PHENOLIC AND OTHER TAR-ACID RESINS:		
Molding materials[a]	96,250,347	84,227,059
Bonding and adhesive resins for:		
Laminating (except plywood)	31,874,901	21,260,836
Coated and bonded abrasives	4,788,698	5,081,653
Friction materials (brake linings, clutch facings, etc.)	7,381,204	7,121,682
Thermal insulation (fiber glass, rock wool)	15,529,628	16,015,290
Plywood	14,757,474	14,212,689
All other bonding and adhesive uses	6,827,408	6,905,993
Protective-coating resins	11,965,398	11,191,792
Resins for all other uses	12,702,547	10,933,304
UREA AND MELAMINE RESINS:		
Textile-treating and textile-coating resins	18,243,906	15,399,818
Paper-treating and paper-coating resins	9,839,613	8,564,688
Bonding and adhesive resins for:		
Plywood	36,934,950	33,551,005
All other bonding and adhesive uses, including laminating	11,926,082	10,363,522
Protective-coating resins	13,460,216	9,942,848
Resins for all other uses, including molding	34,503,465	31,378,794
STYRENE RESINS:		
Molding materials[a]	157,696,945	153,903,597
Protective-coating resins	41,902,928	40,486,382
Resins for all other uses	49,049,552	46,248,398
VINYL RESINS, total[b]	256,138,597	245,504,356
Polyvinyl chloride and copolymer resins (50 percent or more polyvinyl chloride) for:		
Film (resin content)		33,720,296
Sheeting (resin content)		31,242,475
Molding and extrusion (resin content)		66,964,948
Textile and paper treating and coating (resin content)[c]		25,423,109
Flooring (resin content)		12,217,126
Protective coatings (resin content)		10,982,541
All other uses (resin content)		14,227,495
All other vinyl resins for:		
Adhesives (resin content)		13,970,057
All other uses (resin content)		36,503,647
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS	85,238,150	94,464,016
MISCELLANEOUS:		
Molding materials[a, d]	92,948,505	78,413,383
Protective-coating resins[e]	4,367,481	1,994,268
Resins for all other uses[f]	57,771,408	59,716,379

* Dry basis is designated unless otherwise specified.
** Partially estimated. † Revised.
[a] Includes fillers, plasticizers, and extenders. [b] Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production are given. [c] Includes

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

IN POUNDS* FOR MAY AND JUNE 1954
by U. S. Tariff Commission

*May***		*June***	
Production	*Sales*	*Production*	*Sales*
1,439,277	1,403,325	1,776,944	1,765,599
935,486	873,630	1,009,026	1,125,567
437,340	398,781	537,096	461,873
5,369,842	5,392,798	6,508,842	5,877,242
482,877	379,248	430,734	386,119
400,549	300,774	429,875	408,754
16,360,260	13,237,745	14,573,518	12,910,297
5,118,846	3,368,568	5,292,952	3,642,058
967,288	798,591	758,100	871,529
1,524,212	1,275,504	1,105,211	1,070,009
3,065,077	2,960,790	3,016,071	2,900,037
2,764,991	2,515,539	1,645,706	1,781,542
851,253	954,917	842,543	769,687
2,212,966	1,876,688	2,187,047	1,920,446
2,152,777	1,852,788	2,357,930	1,856,436
2,856,271	2,740,237	3,293,125	3,095,630
1,852,728	1,340,077	1,164,395	1,374,285
5,998,192	5,390,588	6,030,908	6,062,535
2,081,943	1,459,503	1,631,672	1,338,440
2,137,180	1,596,687	2,526,469	1,998,432
5,840,781	5,038,478	6,054,032	5,377,062
26,571,647	23,986,936	24,310,839	21,911,313
7,450,521	7,177,353	7,446,427	6,663,681
8,467,038	7,782,194	8,939,090	8,534,224
42,163,263	39,510,320	43,814,285	38,241,074
	4,774,708		5,100,388
	3,839,635		3,002,980
	11,096,175		10,529,008
	3,582,239		3,551,777
	3,256,144		3,553,973
	1,730,486		1,916,310
	2,643,190		2,743,945
	2,577,888		2,499,962
	6,009,855		5,342,731
14,102,933	14,108,963	14,862,328	14,632,026
15,396,985	12,849,213	13,504,705	12,604,754
317,514	291,648	827,601	374,874
†10,103,094	†10,248,670	10,217,427	10,168,780

data for spreader and calendering-type resins. [d] Includes data for acrylic, polyethylene, nylon, and other molding materials. [e] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective-coating resins. [f] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

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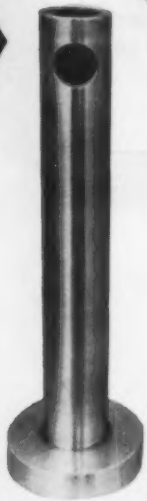


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Plastics Fences

INTEGRAL airplane wing parts, called fences, that are made of reinforced plastics on cast epoxy resin molds are among the latest experimental developments in plastics engineered at Republic Aviation Corp.

The fences help solve an air-flow problem which arises in the use of very-high-speed swept-back wings, especially if the wings, as in Republic's RF-84F, house the jet engine air intake ducts. The wing on the RF-84F has four rib-like fences running in the direction of the plane's flight which channel the air across the wing and increase lifting efficiency.

Conventionally, these fences are made of aluminum. For the RF-84F, however, Republic has been testing fences made of glass cloth-polyester resin laminations. It is felt that such



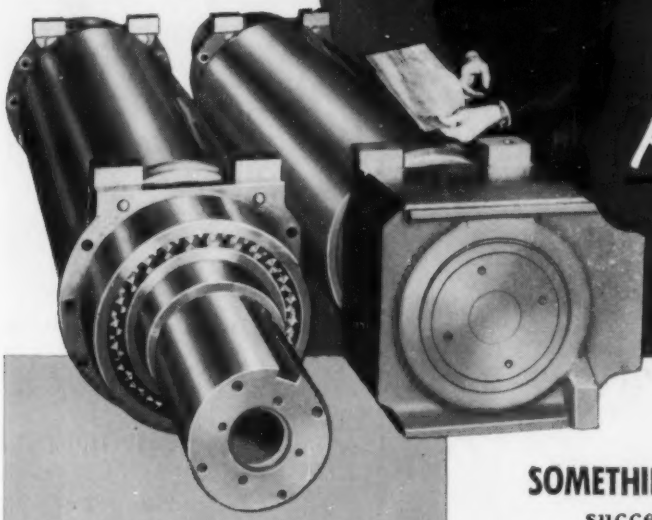
Experimental reinforced plastics fence is fitted onto wing of RF-84F jet

a construction would save weight and cost—primary considerations in the manufacture of very-high-performance military aircraft.

The experimental plastics fences were produced by Republic with eight sets of three-piece fibrous glass-reinforced epoxy resin molds. These plastic molds were made in 4 weeks instead of the 4 months that would have been needed for matched metal molds. In the production of the fences, Republic can hold the units to a tolerance limit of 0.020 in. in deviation from the fence center line, even for the 8-ft. length.

The F-84F Thunderstreak already incorporates more than 200 reinforced plastics parts in its construction.

Anti-Friction Mill Roll Bearings



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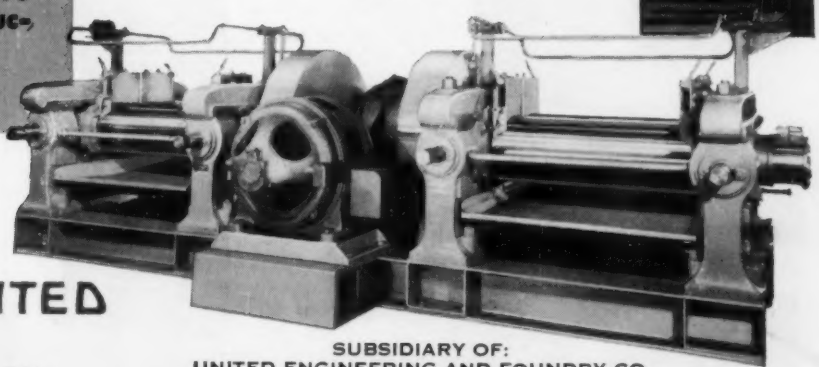
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Close-up of Swinging Stock Guide ▶



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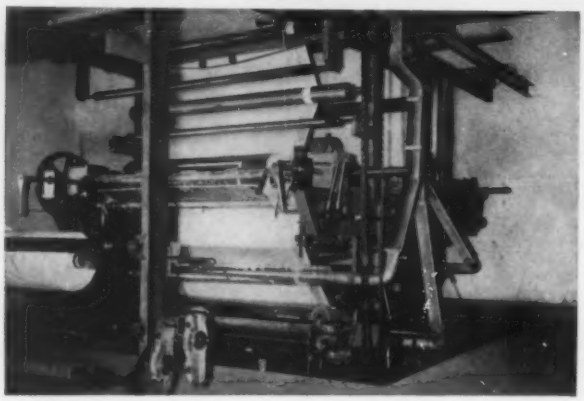
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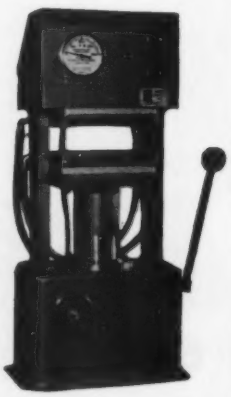
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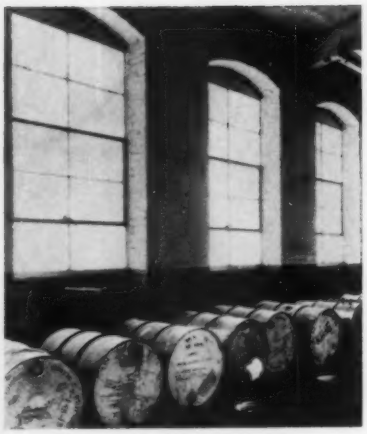
20-ton model

Meeting industry-wide demands, PHI now presents the 60-ton H Type "Jumbo" Model with 18″ x 18″ platens. Ram: *6¾″*. Stroke: *4½″*. Hydraulic Pump: *Manual, Air or Electric*. Temperature Control: *To 600°, including cooling*. Modifications to suit customer requirements. Write for detailed circular.

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Glazing panels of acrylic increase amount of daylight inside a plant

Acrylic Windows

A YEARLY window replacement bill of about $400 is reported to have been eliminated in a paint manufacturing plant by installing shatterproof translucent acrylic glazing panels in place of glass panes.

In addition to cutting maintenance costs, the 0.125 in. thick acrylic panels, because of their excellent light diffusing properties, permitted part of the old window openings to be bricked up for much needed wall space without reducing the amount of effective daylight inside the plant. The amount, in fact, actually increased to the extent that shadowy areas around machinery and underneath shelving are bright with daylight even on dark and cloudy days —a feature that can be translated into savings on electric light bills.

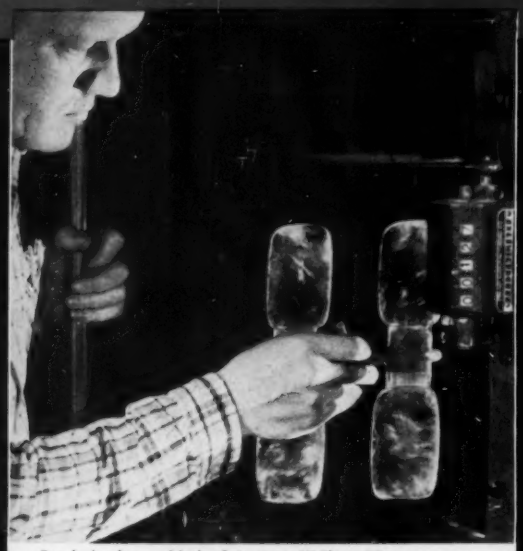
The outside appearance of the building has also improved considerably by the installation of the acrylic panels. Basement windows which previously had to be boarded up because of continual breakage from trucks and general industrial traffic, are now neatly bricked up, except for a small acrylic-glazed area that supplies sufficient light for working in the basement.

Replacing acrylic with glass has resulted in two additional advantages: reduction of sky glare to a minimum and the elimination of a distracting view of outside traffic.

CREDITS: The acrylic panels, fabricated from Plexiglas sheet supplied by Rohm & Haas Corp., were installed in the Philadelphia plant of Keystone Refining Co.

"LUSTREX HI-FLOW 55 styrene cut our cycle time from 120 to 78 seconds!"

Mr. Joseph Josephs, President
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"Monsanto's Lustrex Hi-Flow 55 styrene is superior to everything else on the market," says Mr. Josephs. "We are producing crystal-clear, quality products cheaper and faster because Lustrex Hi-Flow 55 styrene lets us reduce molding temperatures

from 450° to 400° in rear of heating chamber,
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from 400° to 360° at the nozzle.

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Results like these are typical of what happens when molders switch to Lustrex Hi-Flow 55 styrene. This soft-flowing styrene molding powder can be used in any standard injection, compression or extrusion machine. Put Lustrex Hi-Flow 55 styrene's work-saving, cost-cutting advantages to work for *you* today. It's ideal for thick section-pieces and deep-drawn applications. Perfect for packaging and food containers, pin-point gating and thin-wall applications where general-purpose styrene has trouble in filling.

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Vinyl Pipe

AUTOMATIC gas-fired hot water heaters are now being equipped with cold water dip tubes made from rigid vinyl that help eliminate internal rust and corrosion.

The extruded tube is designed to replace conventional metal pipe in conveying cold water from the top of the tank to the bottom close to the source of the heat. Metal pipe previously used proved unsatisfactory for the job, primarily because of the fact that when galvanized steel is used for hot water heaters, an electrolytic action results between the metal dip tube and the zinc tank lining which eventually causes corrosion of the steel tank.

To solve the problem of electrolysis due to dissimilar metals inside the tank, the manufacturers undertook a long testing program of various materials and chose vinyl.

In addition to its excellent dimensional stability, the vinyl pipe showed little deformation when tested for 48 hr. at 200° F.—normal service operating temperatures for a hot water tank are usually only between 140 and 160° F. Under this A.G.A. standard test in which the pipe is hung vertically in water, the linear shrinkage was less than ½ inch.

The extruded vinyl pipe is also resistant to acids, alkalies, solvents, greases, and oils.

CREDITS: Vinyl pipe is extruded by Alpha Plastics, Inc., West Orange, N. J., using Geon vinyl supplied by B. F. Goodrich Chemical Co., Cleveland, Ohio. Pipe is used as a dip tube on heaters manufactured by Pennsylvania Range Boiler Co.



Rigid vinyl dip tubes help prevent internal corrosion in hot water heaters



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Thus writes Mr. E. M. Elliott, General Manager, Plas-Steel Products, Inc., of Walkerton, Indiana. Plas-Steel supplies more than a million glass rod blanks, annually, to the fishing rod industry.

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Plastics Chimes

MELODIOUS double-tone, non-electric plastics door chimes are designed, in one model, to permit residents of apartments and private homes to see who is calling without being seen.

Two plastic materials are used in the construction of the unit. The front plate, which is a combination name plate, viewer, and push button holder that goes on the outside of the door, is molded of clear styrene. With the exception of the name plate and the dome which encloses the viewing lens, the entire part is spray-painted in gold on its reverse side.

The chime housing which goes on the inside of the door is molded to close tolerances of brown urea. In assembling this half of the unit, the chime mechanism is press-fit directly into molded-in bosses in the housing. The two tone bars which are located on top and bottom of the chime mechanism are pre-assembled to metal holders which are then eyeletted to two bosses in the housing.

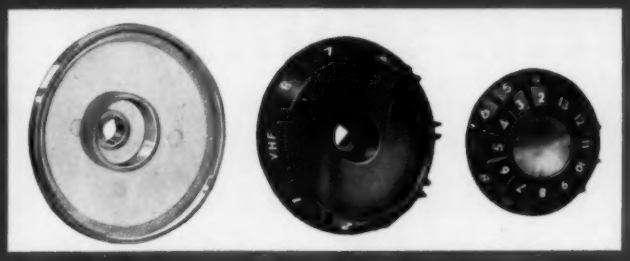
Connecting the two halves of the chime assembly through the door is a molded-in tube that projects out from the back of the front plate and fits into a special opening molded into the rear housing. The wide angle viewing lens that brings callers into view even though they may be standing to one side of the door is cemented into this tube.

CREDITS: Vu-All door chimes are a product of Cable Electric Products, Inc., Providence, R. I.

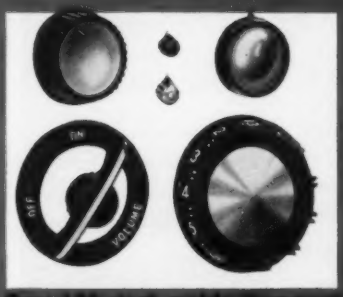


Clear styrene front plate for urea chime housing is back-painted in gold

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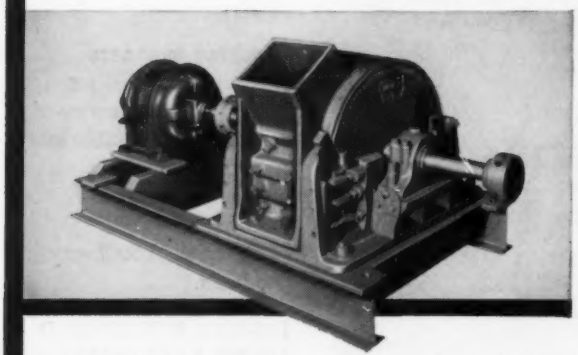
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The basic vinyl splint is supplied with aluminum supporting bars, a detachable U-shaped bar, a rawhide loop, a Pierson attachment for foot support, and a waxed cord which is tightened over two rows of hooks to hold the splint in place. When in use, the inflatable splint is laid out with the bars, foot support, and loop in position. It is then inflated by mouth, bicycle, or hand pump before the extremity is placed in the splint and immobilized. Longitudinal air chambers keep the splint straight; a transverse chamber at the bottom keeps the heel elevated and one at the top comfortably functions like a Thomas ring.

Danger of pressure sores or of circulatory embarrassment from swelling of soft parts is eliminated by the pneumatic character of the splint. Where traction is needed, the U-shaped bar and Pierson foot piece are incorporated in the splint. The rawhide loop is wrapped around the ankle outside the Pierson attachment bars, and tied over the end of the traction bar.

CREDITS: Made of Krene vinyl supplied by Bakelite Co., the pneumatic splint was designed by Dr. Charles T. Berry, and is produced by Fabrico Mfg. Corp., Chicago, Ill.

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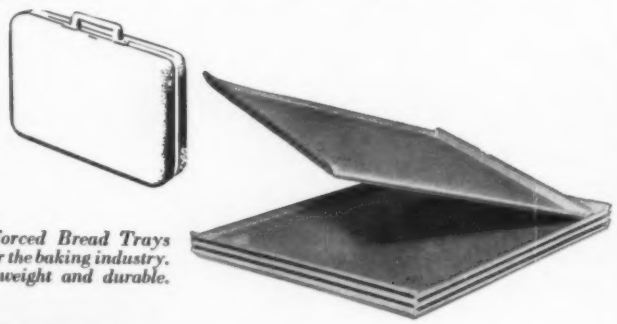
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Tool Kit Box

INTRODUCTION of a molded high-impact styrene box to replace a metal container for a kit of valve and bibb reseaters is claimed to have resulted in an approximate 50% increase in the number of units sold. In contrast to the drab metal case, the new box is an attractive two-tone job—a bright green base and black cover—that adds much to the sales appeal of the package.

The compactly designed case is molded in three separate parts—a deep base, a shallow cover, and a flat tray insert. The cover and base are fastened together at the back with three metal hinges and the removable tray insert rests on eight triangular ribs molded into the corners and along the walls of the inside of the base.

Contoured depressions molded into the base and tray insert accommodate each of the tools that make up the kit. In the metal box formerly used, separate metal dividers had to be inserted into the base of the box—a costly and time-consuming operation—to form the desired individual compartments.

Raised code numbers molded into the bottom of each well or groove which houses a part conveniently identifies each piece so that the customer will have no trouble in ordering replacements.

CREDITS: Box is molded by North American Plastics, Chicago, Ill., for M. B. Skinner Co., South Bend, Ind. Parts are molded in single-cavity molds on 12-oz. Impco machine. Styrene is supplied by The Dow Chemical Co.



Tools fit neatly into depressions in base and tray of styrene container

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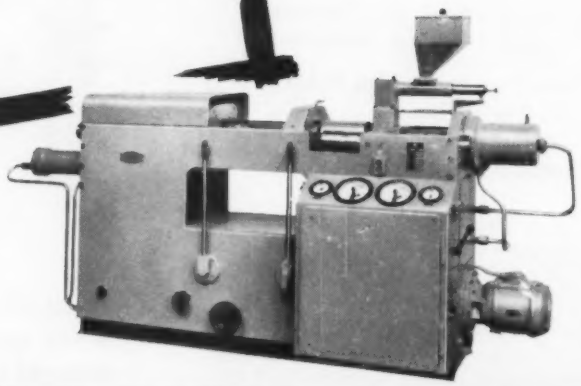
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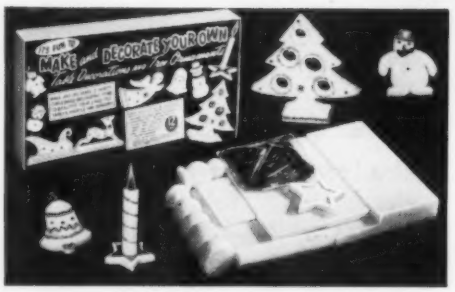
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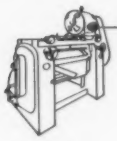
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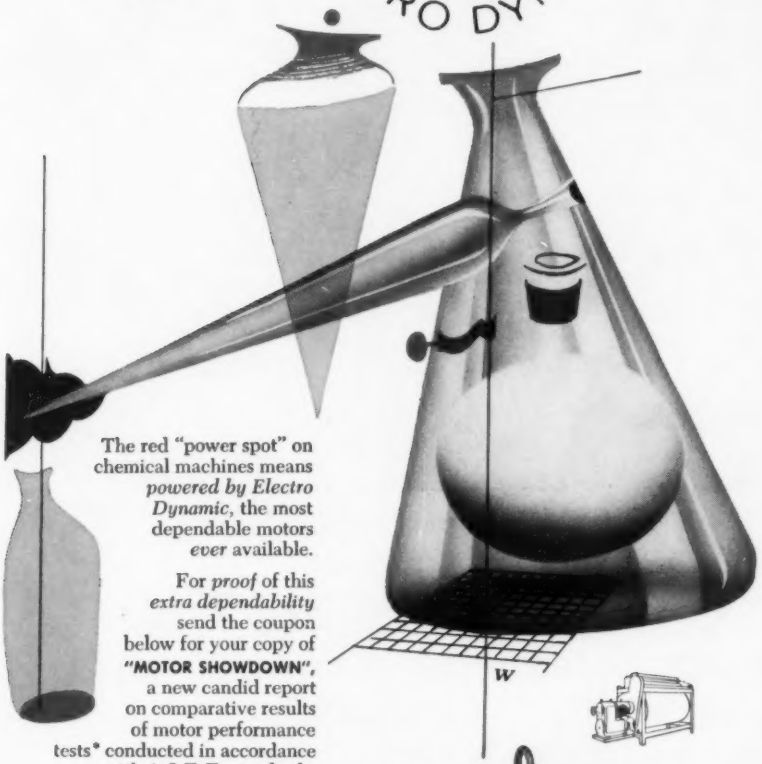
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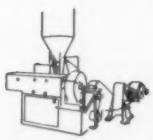


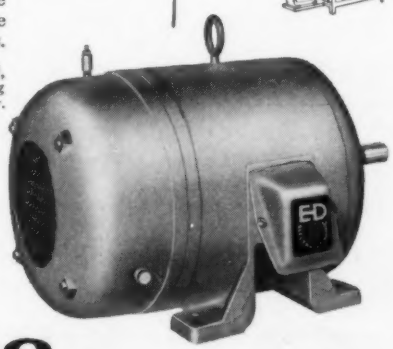


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Lightweight melamine-plaster arm cast does not hinder worker on the job

Melamine Cast

CASTS made from a new melamine resin-plaster of Paris material known as Melmac Bandage — reported to be the first product of its kind to be introduced to the orthopedic field — promises greater comfort and speedier return to regular activities for patients suffering from fractures.

Adding melamine resin to the plaster makes the casts stronger, yet much lighter in weight — because they are thinner — than conventional all-plaster casts. In addition, the Melmac Bandages permit clearer X-rays, are washable, and are completely resistant to perspiration and urine. A doctor can prepare a cast quickly simply by dipping the Bandage in water.

Because lightweight body casts made with the new material are far less fatiguing to wear than the heavier all-plaster casts, earlier ambulation is possible for leg fracture patients. By the same token, patients with arm casts will be able to return to work that requires use of their hands while the fracture is still mending. Similarly, youngsters with arm casts will be able to return to their playtime pursuits during the mending period.

Even housewives with arm casts made from the Melmac Bandage can perform dish washing and other kitchen chores without fear that the cast will break down because of exposure to water.

CREDITS: Melmac Bandage is a product of Davis & Geck, Inc., a unit of American Cyanamid Co.; Melmac melamine resin is also supplied by American Cyanamid Co.



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VACUUM FORMING SERVICE. Information on the custom vacuum forming service offered by this company, and illustrations of typical large area and deep draw pieces which they are prepared to make. The Vlchek Tool Company. (J-402)

MAGNETIC SEPARATORS. The use of electric and non-electric magnetic pulley-type separators to protect mills, calenders, and injection and extrusion machines from damage from tramp iron, is explained in a folder issued by Magnetic Engineering and Mfg. Company. (J-403)

STAMPING NAME PLATES. Data on the methods and equipment which are used to stamp etched metal name plates with numbers and other types of identification. The Acromark Company. (J-404)

PLASTICS EXTRUDER. Informative bulletin on a 2½" extruder gives details of construction, electrical equipment and temperature regulation apparatus. Describes special cross-head for covering wire and a blowing head for extruding film and sheet. A. Reifenhäuser. (J-405)

MOLD REFRIGERATION. Folder explains how both production and quality of output are improved when a specially designed industrial refrigerating system is used to maintain mold temperatures. Mayer Refrigerating Engineers, Inc. (J-406)

JET PULVERIZER. Information about the operation of a unique machine for reducing plastics, fillers, and a wide variety of products to extreme fineness. Majac Engineering Co. (J-407)

REINFORCED PLASTICS MOLDING. Booklet illustrates the production facilities and typical reinforced plastics moldings for consumer and military use manufactured by Lunn Laminates, Inc. (J-408)

GRANULATING MACHINES. Folder explains the features, operations and advantages of Leominster granulating machines for reducing sprues, runners, and other scrap to uniform size. Leominster Tool Co., Inc. (J-409)

"GLYKON" POLYESTER RESINS. General information booklet on the compounding, curing, fabricating and molding methods most suitable for manufacturing a wide range of products and components from the polyester resins produced by The General Tire & Rubber Company (J-410)

BUYERS GUIDE FOR "KEL-F." Booklet lists many companies engaged in molding, fabricating, extruding and coating of "Kel-F," thermoplastic polymer material which is used extensively in the chemical, electronic, food, aircraft and other industries where corrosion control, dielectric strength, heat resistants and other similar properties are needed. M. W. Kellogg Co. (J-411)

"PARAPLEX" AND "MONOPLEX" PLASTICIZERS. Technical data on ten plasticizers. Charts compare their performance against TCP and DOP. List of recommended applications. Rohm & Haas Company. (J-412)

"THE MARBLETTE MIRROR." Current issue of this house organ contains interesting articles on the use of phenolic casting resins in aircraft tooling, metal fabrication and in the manufacture of vacuum forming dies. The Marblette Corporation. (J-413)

EXPANDABLE POLYSTYRENE. Booklet contains technical and application information on a new foamable polystyrene. Product applications include thermal insulation, sandwich constructions, electronics, packaging, and toys, novelties and displays. Koppers Company, Inc. (J-414)

MOLDED FIBER GLASS. Data on the properties of, and applications for, fiber glass reinforced plastics molded in matched metal dies. Folder describes the facilities for custom molding fiber glass products available at Molded Fiber Glass Company. (J-415)

VACUUM FORMING BUTYRATE. Various methods of forming, heating and forming equipment, molds and mold materials, cutting and blanking, decoration, and additional subjects connected with the manufacture of plastics signs and other products by vacuum forming of butyrate sheet are discussed in a booklet issued by Eastman Chemical Products, Inc. (J-416)

TUBES FOR HF PLASTICS SEALERS AND HEATERS. Catalog lists the characteristics of various tubes used in electronic sealers and heaters for plastics. Amperex Electronic Corp. (J-417)

MOLD TEMPERATURE CONTROL. Folder on "Thermolator" controls for maintaining injection mold temperatures within limits of ½° F. Industrial Mfg. Co. (J-418)

VINYL STABILIZERS. Folder gives brief descriptions of 24 Advance heat and light stabilizers for vinyls. Lists special characteristics of each. Advance Solvents & Chemical Corp. (J-419)

RADIANT HEATING FOR WEBS. Data on the use of "Chromalox" far-infrared radiant panels to pre-heat, cure or dry supported and unsupported plastics film webs. Edwin L. Wiegand Co. (J-420)

TETRAHYDRO PHTHALIC ANHYDRIDE. Technical bulletin on the physical properties and more important chemical reactions of this anhydride which is of particular value to producers of plasticizers, resins, adhesives, and chemical intermediates. National Aniline Division, Allied Chemical & Dye Corporation. (J-421)

DECORATIVE LAMINATES. Information on and illustrations of a line of decorative plastics made by laminating fabrics, Fibreglas, botanical specimens and other items between rigid vinyl sheeting. Pan Laminates, Inc. (J-422)

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POSITIVE CUT-OF VALVE. Bulletin illustrates and explains the features of a unique rotating disc valve designed to end characteristic dry valve problems usually encountered in handling powders, pastes and crystals. General Machine Company of New Jersey. **(J-423)**

HARD CHROME PLATING FOR MOLDS. Magazine reprint describes the use of hard chrome plating to prolong the life of plastic molds. Explains plating process used by Nutmeg Chrome Corp. **(J-424)**

"KELLERFLEX" CARBIDE BURS. Brochure on high speed carbide burs of various sizes and designs for performing a wide range of finishing and cutting operations in mold making and general machine work. Includes data on flexible shaft machines. Pratt and Whitney, Div. of Niles-Bement-Pond Co. **(J-425)**

"VOLAN" FINISH FOR GLASS FABRIC. Data on "volan" methacrylato chromic chloride for treating glass fabric so it will bond more securely with low pressure polyester type resins to produce laminates with high flexural strength, particularly under severe moisture conditions. E. I. du Pont de Nemours & Co., Inc. **(J-426)**

"PLIO-TUF" PELLETS. Data on "Plio-Tuf" pellets, which are dispersions of color pigments in "Plio-Tuf" G75C resin, a high styrene copolymer. Booklet explains the advantages of using this product in injection molding and extruding. The Goodyear Tire & Rubber Company, Inc. **(J-427)**

PLASTICS EXTRUSIONS. Leaflet on the custom extruding service offered by this company with special emphasis on vinyls. Covers sample making, color matching, quality control, and compound development. Vogt Manufacturing Corp. **(J-428)**

THERMOPLASTIC COLORANT. Folder contains price list on metallic and PMMA opaque and transparent coloring materials for styrene and other plastics. Data on a wetting agent to increase efficiency of dry coloring. Plastic Molders Supply Co., Inc. **(J-429)**

"FIBERGLAS" FABRICS. Chart lists physical properties and specifications of 42 styles of "Fiberglas" fabrics in different widths, weights, constructions, and weaves. St. George Textile Corp. **(J-430)**

MIXERS. Folder on Bailey pre-plasticizing mixers for combining plastic constituents before feeding them to extruders, injection molding machines, mills, etc. R. N. Bailey & Co., Inc., **(J-431)**

INDUSTRIAL CHEMICALS. Catalog enumerates and describes the various plasticizers, plastics resins, solvents, and other industrial chemicals manufactured and sold by Tennessee-Eastman Co., Div. of Eastman Kodak Co. **(J-432)**

ELECTRIC HEATING UNITS. Brochure enumerates and describes various types of Vulcan electric heaters, including immersion, strip, tubular, ring and band types. Prices included. Vulcan Electric Company. **(J-433)**

POLYESTER RESIN. Tentative data on a new water-white rigid polyester which can be cured tack-free in the presence of air, and which is recommended for hand lay-up work to be cured at room temperatures and for general purpose molding. Interchemical Corporation. **(J-434)**

VACUUM FORMING. Technical data on the process of vacuum forming thermoplastic sheet materials with special emphasis on the use of "Mirro-Brite" metalized butyrate in the manufacture of displays, toys, industrial components, and similar items. Sample included. Coating Products. **(J-435)**

STABILIZER. Data sheet on "Stabelan HR," an efficient heat and light stabilizer for vinyl chloride polymers and copolymers. Harwick Standard Chemical Co. **(J-436)**

COLOR PROPORTIONER. Information on a unit which replaces the hopper of extrusion and injection molding machines and feeds a readily controlled amount of color concentrate and neutral plastic compounds to form a uniformly blended mixture in a continuous automatic operation. Progressive Machine Co., Inc. **(J-437)**

ORGANIC CHEMICALS. Brochure depicts the various plants and laboratory facilities for the manufacture of organic chemicals operated by Witco Chemical Company. **(J-438)**

"INFRALITE" HEATERS. Data on high-efficiency radiant heaters which emit more than 100 watts per square inch of surface for vacuum forming, curing castings, drying resins and other similar applications. N. J. Thermex Company, Inc. **(J-439)**

ORGANIC PEROXIDES. Booklet lists and describes twenty organic peroxides which are of interest as catalysts in the curing of polyester resins. Luidol Division, Wallace & Tiernan, Inc. **(J-440)**

"PHYSICAL PROPERTIES OF SYNTHETIC ORGANIC CHEMICALS." 1954 edition of this booklet presents data on more than 330 products. Lists appearance and physical properties. Carbide and Carbon Chemicals Co., Div. of Union Carbide and Carbon Corp. **(J-441)**

REPAIRING REINFORCED PLASTICS PARTS. Explanation of the recommended methods for repairing breaks in automobile bodies, boat hulls and building panels made of glass fiber-reinforced polyester plastics. Naugatuck Chemical. **(J-442)**

VULCANIZED FIBRE. Folder covers the characteristics—light weight, strength, resiliency, dielectric strength, machineability—which make vulcanized fibre sheets, rods and tubes suitable for many applications. National Vulcanized Fibre Co. **(J-443)**

TECHNIQUE OF COLORING NYLON. Data on the use of Ferro inorganic dry colors for coloring nylon molding powders prior to injection molding. Accompanying bulletin lists cost per pound and proportions for various colors. Ferro Corporation. **(J-444)**

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Posting Tray

DESIGNED for greater efficiency, modern new machine posting trays formed of Boltaron styrene copolymer sheet under low pressure are sturdy, yet light in weight and easy to handle.

Low-cost molds are used to form the trays of decorative grey morocco grain sheet—a far cry from the conventional dull metal finish—in an attractive modern one-piece design with rounded corners that do not trap dust or dirt and can easily be wiped clean with a damp cloth. A curled lip which serves as a finger grip when pulling the tray is incorporated into the front of the one-piece unit.

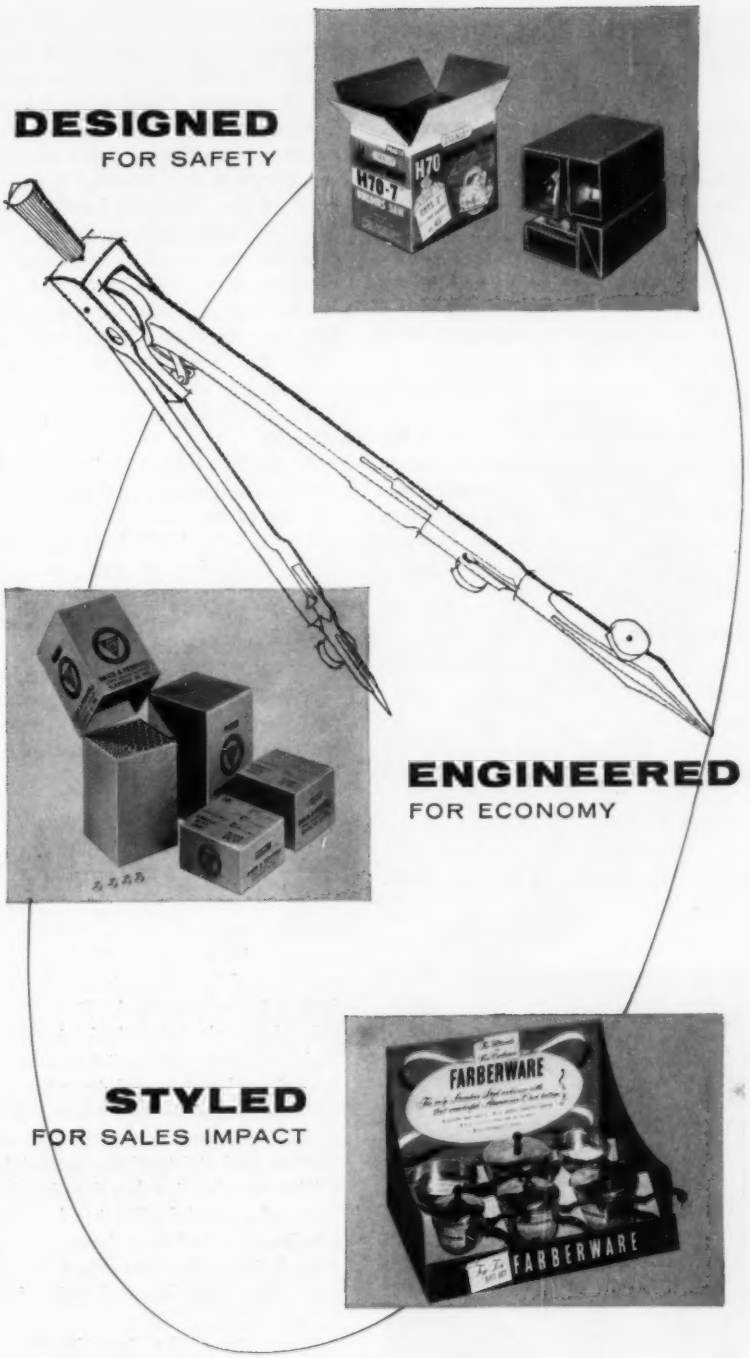
Although the new posting trays have a capacity of 1600 sheets, they weigh only 3½ lb. apiece. They are also shatterproof, will not crack or chip, and are highly resistant to scratches and abrasion. Reinforcing trim of satin-finish aluminum is fitted to the long edges of the tray for added rigidity.

Aluminum sheets, standing 10 in. high and spaced approximately 1 5/16 in. apart, serve to divide the tray into seven separate sections to accommodate the 26-division index. Because of these aluminum separators, the need for a follower plate that has to be continuously adjusted as files are added to or removed from the tray is eliminated.

CREDITS: The posting trays are fabricated by Mercury Plastics, Chicopee, Mass., for National Blank Book Co., Holyoke, Mass. The Boltaron 6100 series sheet is supplied by Bolta Products, Div. of The General Tire & Rubber Co., Lawrence, Mass.



Rugged posting trays formed of styrene copolymer sheet are light in weight



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Fastest Growing

(*From pp.* 91-96)

case was designed as a thin section with sufficient flexibility to permit the halves to be easily swung open, the clasp with enough spring to be quickly snapped into place, and the drill locks with the semi-rigidity required for the gripping action. At the same time, the two halves of the case were beefed up for rigid support. And the entire case — hinge, halves, clasp, and drill locks—is molded in one piece!

Additional advantages claimed for the case are the fact that polyethylene can be colored to identify private brands and the ease with which indications of drill sizes can be permanently hot-foil stamped on the inside of the case.

Lunch Box

A different, although equally successful, method of hinging separate polyethylene parts was used to advantage in the design of a molded polyethylene lunch box. With the exception of a wire clip intended to hold a Thermos bottle in place, the entire unit is molded of polyethylene by Dapol Plastics, Inc., Worcester, Mass.



Courtesy E. I. du Pont de Nemours & Co., Inc.

Molded polyethylene flashlight case overcomes problems of corrosion

There are five separate parts that go into the assembly of the lunch box — the base, cover, strap, and a set of clasps for the front of the box. Hinging the base and cover together at the back presented a special problem, since it was felt that the pressure of the Thermos bottle would cause a flexible hinge to deform. The problem was solved by molding two circular lugs — sufficiently thick to be fairly rigid — into the edge of the box top. To assemble the unit, the studs are slipped into two slots molded into the bottom half of the box and curled under the edge of the slots.

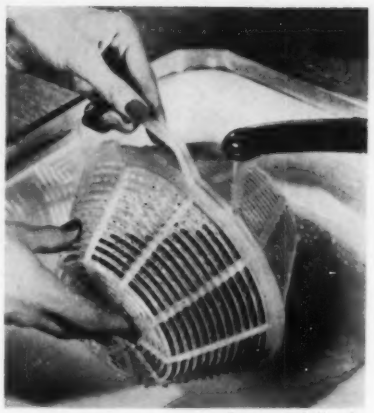
A simple molded-in lug and slot arrangement assembles the strap to the top of the box. Because of the flexibility of polyethylene, the clasps at the front of the box give the same effective closure action as conventional metal hasps. The molded polyethylene ring inserted into a slot in the lug molded into the bottom half of the box is simply swung up and snapped into place over a matching lug in the top half of the box.

Adhesives

As described above, a major limitation in working with polyethylene is the difficulty of cementing the material to itself. Most present-day adhesives, in order to be effective, must be able to penetrate the surface of the material. Because of polyethylene's chemical inertness and its consequent resistance to the organic solvents used in adhesives and because of its non-porous characteristics, most conventional adhesives peel right off the material.

The possibilities for the development of a special adhesive for polyethylene in the future, however, look very bright. One important step in this direction has already been taken.

Ever since the introduction of polyethylene, it has been almost as difficult to adhere the plastic to other materials as it has been to adhere it to itself. But now, after 4 years of intensive research, Rubber & Asbestos Corp., Bloomfield, N. J., has come up with two new adhesives, S-155 and S-183, which can bond polyethylene to leather and fabric. The adhesives were developed for use by Endicott-Johnson Corp., Johnson City, N. Y., in bonding molded polyethylene counters into



Courtesy Bakelite Co.

Two halves of flexible food strainer are hinged together at one end

shoes. These counters are inserted into the linings in the back part of the shoe as protection against severe wear and bending, particularly in children's shoes. Because of polyethylene's ability to return to its original shape after bending, the material is ideally suited to the use.

The success of this application, which is going to be licensed by Endicott-Johnson Corp. to other shoe manufacturers, was aided to a great extent by the development of the adhesives.

According to the management of Rubber & Asbestos Corp., inquiries have already been received as to the possible adaptation of the adhesives to similar applications. The company also optimistically reports that there is a good chance that an effective polyethylene-to-polyethylene adhesive, based on the principles of S-155 and S-183, may soon be in the offing.

Closure Linings

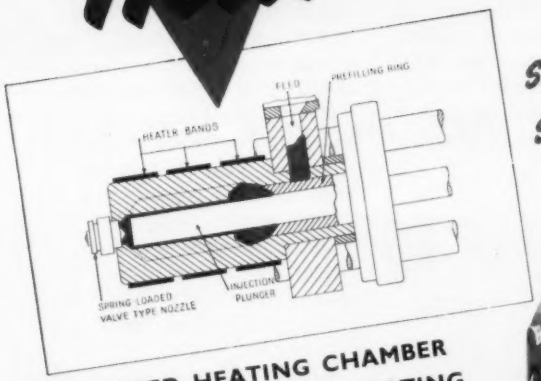
The increase in the supply of polyethylene has also turned the attention of manufacturers to large-volume small applications, such as closures and closure linings. Part of this growth in interest in the mass-production items can be attributed to the adaptation of small fully automatic molding machines to the production of such items at a minimum cost.

According to The Poly-Seal Corp., New York, N. Y., for example, which turns out an unusual molded polyethylene closure lining, the production of the units in a 24- to 40-cavity mold in a fully auto-

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INJECTION MOLDING MACHINE

SPECIFICATION

Approximate weight of material plasticised per hour (Dependent upon weight per shot and material used)	22 lb.
Area of Injection plunger	2.074 sq. in.
Pressure per square inch on material at end of plunger	9,100 lb.
Total pressure on Injection plunger	18,850 lb.
Mold opens (adjustable)	6—9 in.
Maximum die space	7½ in.
Minimum die space	3½ in.
Maximum recommended casting area in mold	15 sq. in.
Size of die plates	16 x 10 in.

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matic 3-oz. molding machine meant a considerable reduction in cost in comparison to the use of 75- to 85-cavity molds in larger capacity non-automatic machines. The latter method required additional finishing expense in the removal of the sprues. Now the linings come off the 3-oz. machine at the end of the 12-sec. cycle, completely de-gated and ready to be inserted in the closure. Pin-point gating is used. The dimensions of the lining are moderately critical to insure a close fit.

In design and use, the lining is also another outstanding example of the optimum polyethylene product. The unit is a simple cone-shaped piece with a hollow sleeve in the center that fits over a lock stud molded into the phenolic cap designed for use with the lining. The flexibility of polyethylene permits the sleeve to be easily slipped over the stud while its quick recovery permits it to grip the stud for a tight locking action.

Once the lining is in position, the cap can be fitted onto the container to eliminate leakage, evaporation, contamination, or backoff. When the cap is turned to the fully seated position, the flexible lining is forced to conform to the horizontal, as well as the sloped, surfaces of the lip of the container — a simultaneous dual action that is reported to effect a better seal over a wider area than is possible with present-day disk-type linings.

Although simple in design, the lining is tough enough to withstand the impact, stress, and torque of high-speed capping machines.

These closure linings, as well as the other applications described above, while certainly to be considered in the realm of big business, are only a part of the polyethylene picture. Any complete run-down of applications that are — or are going — on the market would include such diverse products as pouring spouts, funnels, sporting goods, storage battery parts, diaphragm valves, flashlights, carboys, and a hundred and one other consumer and industrial items — and the chances are good that any such list would probably exclude dozens of products which nobody has even thought up, but which will be born in some imaginative molder's mind next year, or the year after that, or the year after that.

The toy industry, for one, has jumped on the polyethylene bandwagon (see "A Challenge to Junior," MODERN PLASTICS, *31*, 148, June 1954), and expects to be out with a whole new raft of applications in 1955.

Molded Housewares

And, of course, there are those perennial favorites — housewares. Five years ago, only about five manufacturers were producing a relatively small number of molded polyethylene housewares. By 1953, the number had increased sevenfold to 35 manufacturers consuming an estimated 12½ million lb. of polyethylene. By 1960, it is estimated that the amount of material absorbed by housewares manufacturers will be more than was produced for all purposes in 1952.



Courtesy E. I. du Pont de Nemours & Co., Inc.

Clever designing applied to polyethylene results in tray for chipped ice

This sudden spurt of activity reflects not only increasing material availability, but also a rising tide of consumer demand for housewares that are non-breakable, light in weight, translucent, colorful, and flexible. The prospect is for a steadily expanding market for such established products as mixing bowls, tumblers, self-sealing food containers, drain trays, etc., and for rapid extension to new applications of polyethylene for molded household goods.

In the latter category, there has been a noticeable trend towards molding larger and larger products. Only this year, a giant 26-qt. wastebasket, standing 15 in. high and measuring 13½ in. in diameter, was introduced by Loma Plastics, Inc., Ft. Worth, Texas, for use in kitchen, office, or about the house. The flexible basket can be squeezed into tight spaces without scratching or marring the walls.

According to the manufacturers, this is one of the largest polyethylene products to be injection molded in the housewares field. The piece is run on a 60-oz. machine, gated directly into the bottom of the part.

Next logical step — a full-size molded polyethylene garbage can?

Another popular new item in the larger molded polyethylene housewares category is a cake tray and cover set, measuring 11½ in. sq. and 5½ in. deep, and molded by Plastray Corp., Detroit, Mich. The cover can be turned upside-down to serve as a bread box.

A grooved channel is molded around the periphery of the shallow tray. To fit cover and tray together, an extended flange molded into the edge of the cover fits snugly into this channel. Because of the size of the cover, a semi-rigid lip, with several ribs extending upwards from it, is also molded completely around the edge of the cover. This simple but effective design lends needed support to the cover without necessitating excessive thickening of the wall sections.

The Next Decade

By adapting the general design principles described above to individual cases, it is possible to produce molded polyethylene products with an almost unlimited combination of shapes, colors, and applications.

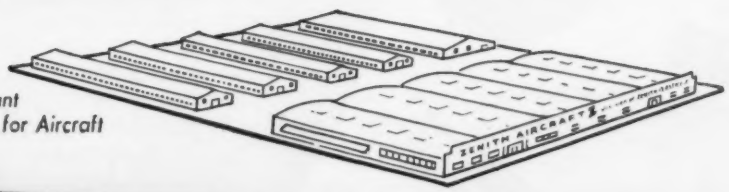
More important, the present climate for such development work is a healthy one. The supply of polyethylene is on the upswing. Consumer demand is high and, while some of it may be attributed to an initial novelty buying phase, the outstanding properties of polyethylene are expected to continue holding favor with consumer and industrial end-users for many years to come.

• • •

The editors of MODERN PLASTICS wish to acknowledge the help of the technical and sales departments of Bakelite Co. and E. I. du Pont de Nemours & Co., Inc., in the preparation of this article.

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Dispensed

(*From page* 105)

to assemble the lid to the case, two small pins molded into the back end of the lid are fitted into matching holes molded into each case half.

Sliding Cutter

The new tape dispenser developed by Johnson & Johnson retains the same basic round shape as the conventional spool-and-shell dispenser. From the standpoint of convenience and attractiveness, however, the new model is far superior.

With the exception of the sliding metal cutter, the entire unit is molded of white styrene. To dispense tape from the new unit, the user first slides the metal cutter back from the open slot through which the tape is pulled out. By sliding the cutter forward until the serrated cutting edge is in contact with the tape and then pulling the tape upwards, the tear-off is made quickly and cleanly.

The dispenser is molded in only two parts—the top and bottom shells, each of which contains one half of the molded-in central core. When assembling the dispenser, the roll of tape is first dropped over the core half in the base shell. The metal cutter, which is curved to conform to the shape of the dispenser, is then slipped into a molded-in depressed rim around the perimeter of the base shell. When the cover shell is snapped into position over the base, the top of the cutter fits snugly into another depressed rim molded into the cover shell. The base and cover shells are held together by a set of small lugs in one core half which snap under a projecting rim molded into the top edge of the other core half. Since the dispenser is tapered, mating rims are also molded into the top and bottom outside surfaces of the shells to facilitate stacking.

Although both of the two new models will cost slightly more than the conventional metal units, market surveys indicate that the many features offered by the plastics dispensers will do much to expand over-all sales of adhesive tape.

CREDITS: Bauer & Black dispenser molded by Federal Tool Corp., Chicago, Ill.; J&J dispenser was designed by Nowland & Schladermundt in conjunction with Johnson and Johnson and molded by Plastics Div., Curtiss-Wright Corp., Carlstadt, N. J.

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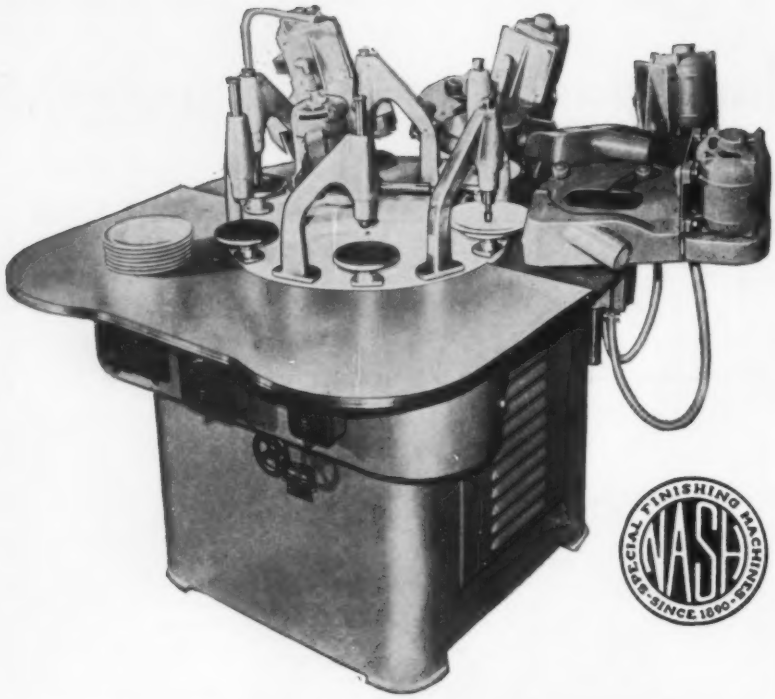
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Plasticizers

(*From pp.* 108-110)

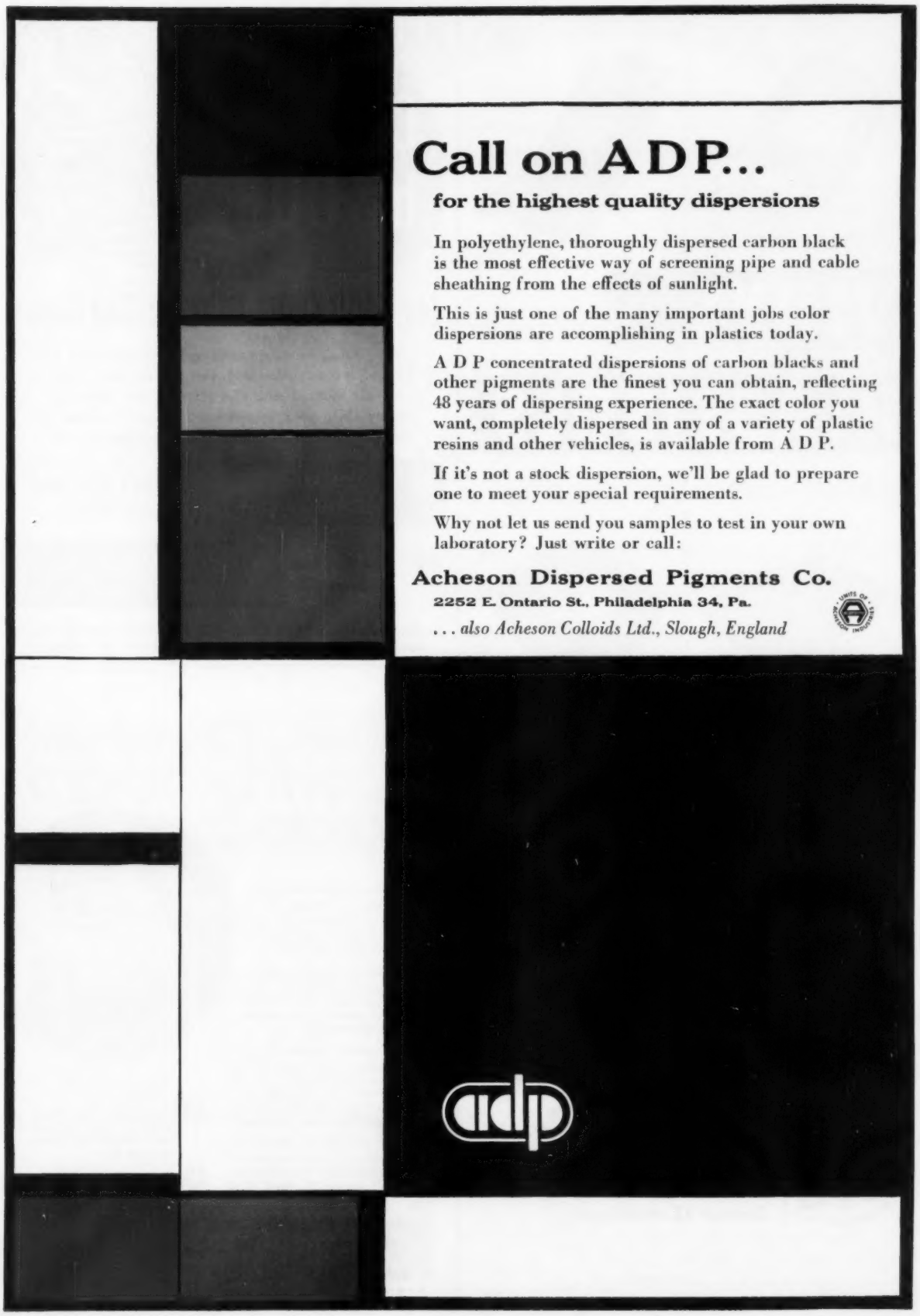
duction for that used in surface-active agents are used only slightly as vinyl chloride plasticizers. They are likely to spew at high temperatures, but when cautiously used contribute softness and "hand" to finished vinyl products.

The biggest volume plasticizer that is not often used for vinyl chloride under the acyclic phosphoric acid ester type is tri-octyl phosphate (T.O.F.) which is generally credited as being among the best of the low-temperature flexibility and flame-resistant plasticizers. It has been widely used in military applications. Since processors learned how to use it for their military jobs, they have transferred that knowledge to use in civilian applications with the result that military cut-backs and re-orders no longer cause such large fluctuations in its use. There are several others of minor volume use, none of them in vinyl, except tributoxyethyl phosphate.

The ricinoleates are derived from vegetable oils, largely castor oil, and are used primarily with vinyl chloride for low-temperature flexibility and to impart "hand." Production volume has remained fairly constant over the last three years. They cost a few cents more a pound than D.O.P. and are not generally used in percentages of more than 3 or 4 up to 25% of the total plasticizer content.

Sebacic acid plasticizers are high cost, but in addition to providing good "hand," they can also be used to obtain low-temperature flexibility on a par with tri-octyl phosphate, although they are not as mildew or flame resistant as the latter. Dibutyl sebacate is used primarily with acetate and cellulose acetate butyrate. Di (2-ethylhexyl) sebacate is used with vinyl chloride and with airplane lubricants to make them less viscous at low temperatures. The sebacates are castor oil derivatives.

"All other acyclic plasticizers" is a classification that covers a multitude of materials, most of them used with vinyl. Among them are the polymeric, polyester, or resinous plasticizers. All three words mean about the same thing in defining a plasticizer. They are derived largely from various types of fats and alcohols. Nearly all of them are noted for



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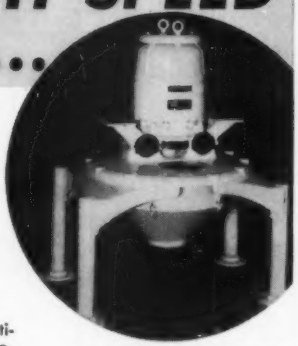
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their non-migrating properties and are highly prized for that reason. On the other hand, they are mostly high cost and many of them are somewhat difficult to blend with other plasticizers. As a consequence, they are generally used in rather low percentages. Somewhere around 20 million lb. of polymerics are believed to have been used in 1953, but the report may not be complete.

The other plasticizers in the "all other acyclics" are fairly well covered in footnote 6, Table I. They, too, include plasticizers of the fatty acid type with a few miscellaneous varieties, and a major proportion of the total 28.5 million lb. in this particular classification are used for vinyl chloride.

From the above interpretations, it is possible to conclude that somewhere near 185 million lb. of plasticizers named in the Government's report was used with vinyl chloride or somewhere between 65 and 70% of the listed plasticizer production. But there is probably about 20 million lb. of other materials, such as extenders and the epoxidized materials which function as combination plasticizer-stabilizers. If these were included, the total plasticizer production for use with vinyl chloride would be about 195 million pounds.

Interpreting Statistics

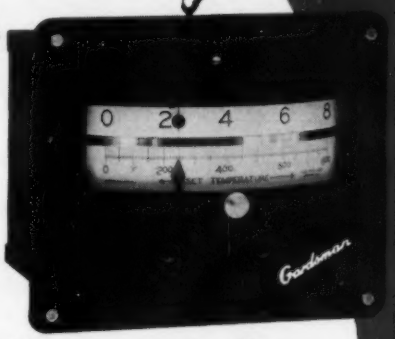
Plasticizer statistics are mighty difficult to reconcile with known facts. In 1945 there was a production volume of 170 million lb., yet less than 50 million of those pounds were for use with vinyl chloride. But there were then such things as 45 million lb. of dibutyl phthalate, mostly for gunpowder, and 19 million lb. of dimethyl phthalate, largely used for insect repellants.

Out of today's Tariff Commission total of 293 mililon lb., somewhere near 190 million is estimated for vinyl chloride, thus reflecting the tremendous growth of the vinyl industry. Nevertheless, there is a feeling among many people in the industry that the plasticizer business is a "stop, look, and listen" kind of business. The fluctuations are tremendous. Substitution of one plasticizer for another and development of new ones is a constantly recurring event. The man who can predict what plasticizers will be sold and in what volume five years from now would indeed be a genius—END.

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Fluorocarbons

(*From pp.* 111-113)

should be avoided if the chemical and physical properties of this resin are to be maintained. (4)

Discoloration due to apparent reaction with cadmium sulfo-selenide reds, and particularly cadmium sulfide oranges and yellows, have been encountered with the color change approximating green-yellow. This is further exaggerated with the use of cadmium sulfide-selenide lithopone letdowns. Such being the case, general preference should be given to the pure type cadmium pigments.

Figures 2 and 3 offer good comparisons to the degrading effect shown in Fig. 1. The decreased extrusion rate per second with the addition of cadmium yellow and red, respectively, show that there is no Fluorothene degradation. (4)

The degrading effect of copper compounds in Kel-F and Fluorothene also holds true for the phthalocyanine greens and blues, although these compounds have limited uses in Teflon. These two colorants are composed of chlorinated copper phthalocyanine and copper phthalocyanine respectively. This is noteworthy since this type pigment is widely used in other phases of the plastics industry where it is generally considered as being stable to light and heat as well as resistant to bleeding oils and common solvents.

After having made the proper color selection, the next factor of importance is the procedure for coloring resins to be used in injection and compression molding compounds, extrusion compounds, and dispersion mediums.

Dry-Coloring Molding Powder

The well known "dry-coloring" technique may be used in the coloring of fluorocarbon resins for injection and compression molding. There are, however, modifications that must be made, because of particle size, in order to produce uniform color. Exceptionally good results have been obtained with dry blending Fluorothene and Kel-F by color addition and simple tumbling. If, however, the particle size is too large, it has been generally found advisable to micropulverize the tumbled mixture.

Teflon, however, cannot be properly ground by this procedure and should be pulverized at sub-zero temperatures. A company well known for sub-zero pulverizing work is the Liquid Nitrogen Processing Co. By this method of sub-zero pulverizing, the resultant powder can be used in either molding or ram or screw extrusion process.

Color Concentrates

Accepted practice is to use a color concentrate in which the colorant is blended with the virgin resins at a ratio of approximately two parts of resin to one part of pigment and the blend then micropulverized. This concentrate is then added to sufficient virgin resin to reduce the pigment concentration to from 0.2 to 1.0 percent. This percentage has generally been found to be the optimum.

Coloring Extrusion Resins

Since the average extrusion machine aids considerably in the dispersion of color mixtures, it has been found that the micropulverizing process can be eliminated for extrusion compounds and that the tumbled dry-color mixture is sufficient for uniform color dispersion. This, of course, will depend upon product application and design in regard to color requirements as well as the use of mixing devices.

Coloring Dispersion Coatings

Probably the most basic problem in proper coloring of dispersion resins is the complete dispersion of the pigment in the liquid medium. This amounts to a complete wetting or grinding of the pigment particles in the dispersion medium and resin and is most readily accomplished by the use of ball milling or roll mill application. To the average molder and fabricator this latter process may be extremely impractical, from a capital investment standpoint. It is thus sometimes advisable to use predispersed or paste colorant.

For coloring aqueous dispersions of Teflon the paste colorants are composed of the pigment and wetting agent Triton X-100.[2] The paste is then made into an aqueous dispersion and blended with the aqueous resin dispersion.

Coloring Inks for Marking

Practically every resin supplier has published ink formulations for producing excellent printing and marking results. Generally speaking, the inks are individually formulated for a particular resin. However, they have been found to be most satisfactory for general use resins and may be mixed and marked by the fabricators. An example of a formulation for Teflon is (5):

	Quantity
Teflon—polyisobutylene dispersion	50 cc.
Loxite 8502 (50% solids)[3]	15 cc.
Triton X-100 dispersing agent[4]	1.3 g.
Pigment	4.0 g.
Water (distilled or filtered)	50 cc.

Mix or shake ingredients well before using.

Conclusion

There is no question but that the physical and chemical properties of fluorocarbon resins have placed the plastics industry in an excellent competitive position in the industrial field. With the development of color adaptability have come the advantages of color identification and sales appeal, as well as easy workability.

The author gratefully acknowledges the editorial and technical assistance of the following:

James H. Versteeg, Development Engineer, New Product Engineering Dept., Bakelite Co. a Div. of Union Carbide and Carbon Co.; F. J. Honn and H. S. Kaufman, Petroleum & Chemical Research Lab., The M. W. Kellogg Co.; B. E. Ely, Polychemicals Dept., E. I. du Pont de Nemours & Co., Inc.

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1) "Physical, Electrical, Chemical and Mechanical Properties of Kel-F"—Technical Bulletin #1-3-53, The M. W. Kellogg Co.

2) "Teflon Molding Techniques"—Information Bulletins No. X-7a, X-42, X-50 and X-55, E. I. du Pont de Nemours & Co., Inc.

3) See company listings of firms manufacturing these type pigments in 1954 Modern Plastics Encyclopedia Issue, p. 847.

4) "Colorants for Bakelite Fluorothene," by J. H. Versteeg, Bakelite Co.

5) "Pigmented Dispersions of Teflon Resins for Color-Marking," E. I. du Pont de Nemours & Co., Inc.

[2] Xylos Rubber Co.
[3] Xylos Rubber Co.
[4] Rohm and Haas Co.

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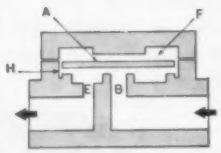
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Air Conditioner

(*From pp.* 106-107)

of an aluminum mesh, permanent-type filter which slides into position vertically through a slot molded in the top of the cabinet and easily accessible from the room without removing the cabinet or any of the parts. It is equipped with a decorative channel along the top edge, which contributes a pleasing design detail and makes it convenient to install and remove. The filter is easily cleaned.

The largest of the plastic parts is the cabinet section, a rectangular frame-like piece into which the drawer slides. It weighs a fraction over 2 lb. and is molded on a 60-oz. injection machine. The drawer component, produced on a 48-oz. machine, weighs 1.98 pounds. The grille sections and louvers for the room cabinet are molded on a 12-oz. injection machine. Two grilles and three louvers are used on each cabinet, with the latter positioned between the room cabinet and the metal exterior section.

Grain and Styling

According to Servel design engineers, one of the major problems solved by using molded plastics for this appliance was that of simulating the appearance of handsomely finished wood in the drawer-type cabinet front. Here a type of styling and grained surface were sought which would harmonize with period furniture.

The front section, with its panelled treatment, would not only have been difficult to form in sheet metal, but would also have required additional finishing operations to produce the desired wood grain finish. This might have been done by painting or through the use of veneer transfers. In either event, additional time, labor, and materials would have been involved. Furthermore, there still would have been a possibility that condensation would eventually rust the underlying metal surface. With the plastic part, the permanent wood grain pattern, as well as the desired contours and lifetime elimination of rust problems, is achieved in a single high-speed injection molding operation, and at lower total cost.

Servel designers also feel that the

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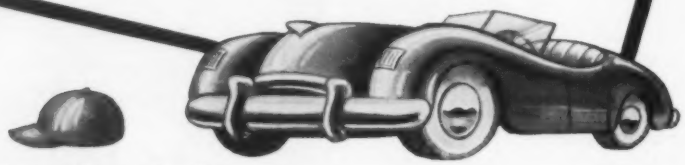


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sound-deadening characteristics of the molded plastic cabinet, and the fact that it is not cold or clammy to the touch, are important advantages not readily obtained with other materials. Obviously, it would be undesirable for a furniture-designed appliance to feel like the inside of a refrigerator—particularly since the hand comes into direct contact with the drawer front when adjusting the unit.

Through the use of molded plastics, it was also possible to engineer sufficient strength and rigidity into the cabinet without the need for reinforcing ribs which would have been necessary had it been formed of thin gage sheet metal—which also might have required some type of insulation to reduce the noise level. In addition, the lighter weight of the plastic cabinet cuts shipping costs and facilitates installation of the unit.

How Grain is Obtained

In cooperation with the custom molder, Servel engineers conducted extensive preliminary molding tests to produce the attractive mahogany grained surface finish on the front section of the cabinet. This effect is obtained by using a mixture of 85% maroon molding material and 15% black material, plus center gating and close attention to optimum gate size and molding pressure. After experimentation with these variables, a realistic, well balanced grain pattern was obtained which is almost identical shot after shot. Servel's experience on this part suggests further applications.

The three air intake louvers, which are inconspicuously located at the back of the room cabinet, vary in certain details, although all are produced from a single mold. These variations are obtained by subsequent drilling and other fabricating operations on the molded parts. When assembled, the louvers form a rectangular air intake through which room air is withdrawn to produce the necessary circulation when the air conditioner is operating.

CREDITS: All plastics parts molded of Dow Styron 475. Cabinet shell and front produced by Chemical Div., General Electric Co., Decatur, Ill., using 60-oz. H-P-M and 48-oz. Watson-Stillman injection machines. Front grilles molded by same company on 12-oz. Reed-Prentice machine. Air intake louvers produced by Kusan, Inc., Nashville, Tenn., using 12-oz. Reed-Prentice.



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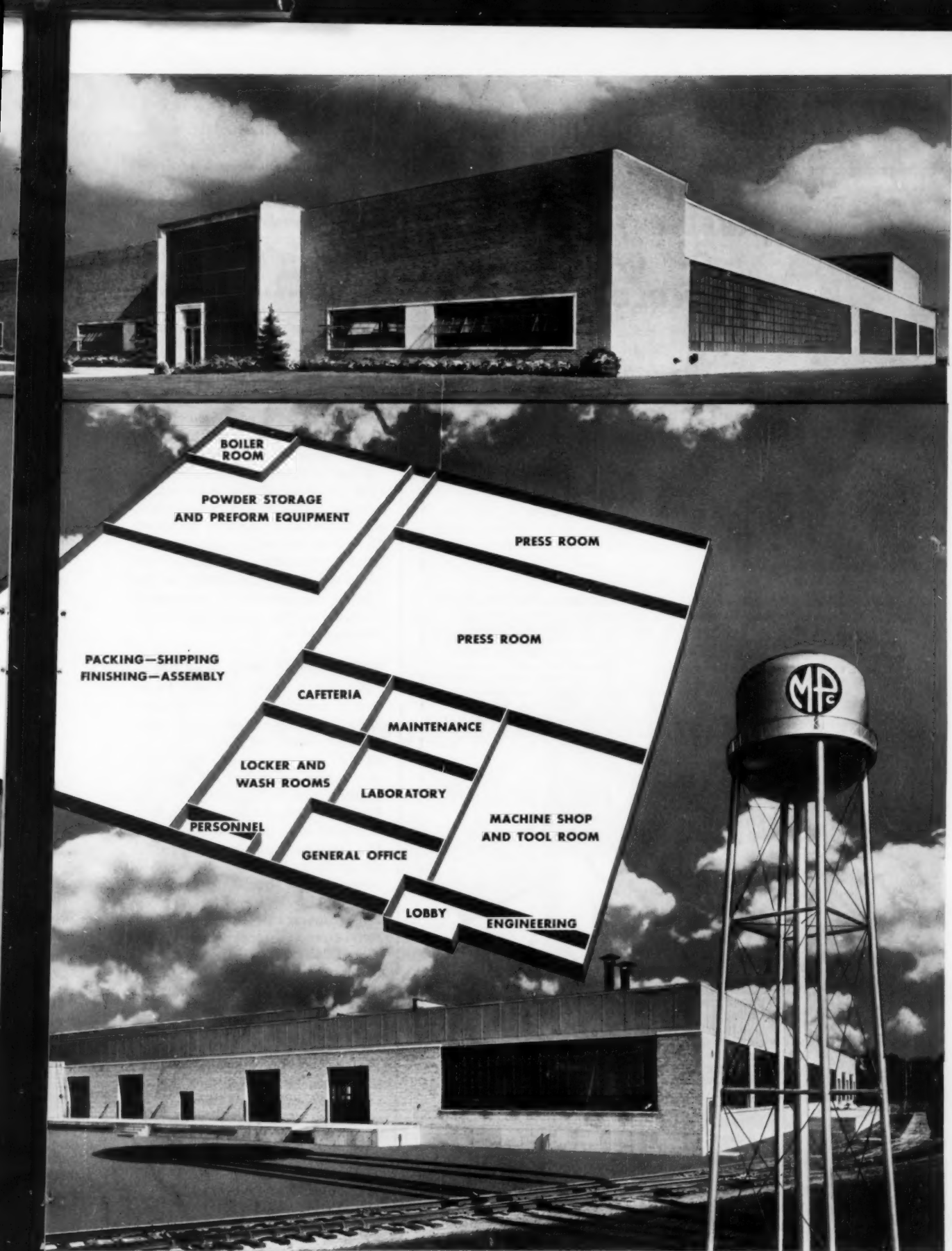
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MARKEM ...TO MAKE YOUR MARK

Drying Ink

(*From page* 137)

bottom or imprinted surface of the web.

Rising from the bottom, the heat carries off the solvent, and both heat and solvent travel out through the ink into the air. The continual passage of hot solvent vapors helps to prevent formation of the top crust. An open gas flame and heat reflectors in separate tests proved equally successful as bottom heaters.

When most of the solvent has evaporated, the printed web is sent through a tunnel or under an overhead dryer for final crusting. It is then cooled with high-velocity air or a chill drum before the windup.

In all of these experiments to retard crust formation with bottom heating, an extreme improvement in the degree of drying was observed. This was especially outstanding in those cases where an overlay of inks was used. Here the ability of the crust to trap the solvent is increased because of the double or triple thickness of the ink.

Instantaneous Deep Crusting

Another printing problem of current concern is the use of high heats to form an instantaneous deep crust of ink on polyethylene film. This method has been successfully tried in the past, using hot air delivered from a tunnel at approximately 225° F. to instantaneously set the ink on a printed web. In that operation the film was run on a supporting rubber blanket to prevent the distortion of polyethylene which normally occurs at high temperature. This arrangement removed the web tension from the polyethylene and placed it on the rubber blanket. Because there was no pull on the polyethylene it did not distort, making use of high heats feasible.

It is now believed that instantaneous deep crusting could be achieved by passing the film over large diameter chill drums and simultaneously applying the maximum possible heat. Preliminary trials indicate some success and, with continued research and cooperation between ink manufacturers, printers, and other interested organizations, the quality of printing on polyethylene film should continue to improve.—END.

Drape Forming

(*From pp.* 138-139)

ity in wall thickness of the formed thermoplastic sheet and also the limits to which the various available materials may be stretched without excessive thinning or rupturing of the original sheet. Drape forming has definitely made possible a more uniform wall thickness and has also made possible greater depth of draws than previously possible.

At first glance drape forming seems to require a considerably greater amount of material than forming into a female mold in a die-box. This does not necessarily follow.

A theoretical forming problem can be used for purposes of illustration. In considering the forming of a cylinder having a 7 in. diameter and standing 7 in. high, assume that this shape could be formed with uniform wall thickness by using a positive male die and also a negative or female die. The drape method will be used to form over the male die and the female die will be formed by the die-box method.

To form a sheet of thermoplastic material into a female mold, allowing ¼ in. on each side for trimming, would require a sheet of plastic (see Table I) which measures 7½ by 7½ in., or 56.25 sq. in. in total area. The only part of the sheet that would be stretched to form the shape of this die would be the area within the circumference of the circle of the die cavity, or approximately 38.5 square inches. This area would have to stretch enough to cover the side walls of the cylinder and the base, which would be a total area of approximately five times its original surface area. Theoretically, a thermoplastic sheet having a thickness of 0.025 in. at the start would be reduced to 0.005 in. thickness. The piece outside of the circle would not be drawn so that it would still be 0.025 in. thickness and would be trimmed off for scrap. The total amount of scrap material would be approximately 0.444 cubic inches.

By using this same shape and draping over the positive or male mold about 2 in. of excess material would have to be allowed on all sides, which would require a sheet of plastic 11 by 11 in. or 121 sq. in. in area. (See Table I.) This full area would be used for drawing over the cylinder. The area covered by this sheet would be 121 sq. in. plus the area of the cylinder wall, which is 154 sq. in., for a total area of 275 square inches. This would cause a theoretical stretch to 2.3 times the original area. Using a 0.012 in. thickness thermoplastic sheet material would leave a wall thickness on the cylinder of 0.005 inches. This leaves the area of the piece outside of the circle for scrap. Since this area has also been drawn and stretched, it is now only 0.005 in. thickness. This leaves approximately 0.413 cu. in. of scrap.

It may be seen from this theoretical forming exercise that, although there may be a slight difference in the amount of material used and in the amount of scrap left, the difference is slight enough as to be of no practical value as there is no set rule that determines the exact amount of excess material needed in the drape method.

Therefore, it is a fair conclusion that with either drape or die-box properly set up, there is little or

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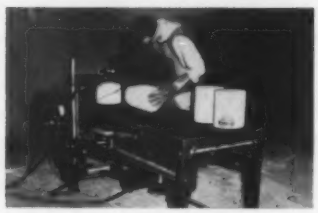
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no difference in the cost of operation. There is, however, the additional capital investment for the drape mechanism, and the cost of maintaining additional moving parts.

The "when" of drape forming can, then, be summarized in this way:

Use the drape method of forming over a male or positive die whenever:

1) The most uniform wall thickness is desired in the finished piece.

2) Close dimensional tolerances are desired inside the finished piece.

3) Maximum wall thickness is desired in the central portion.

4) The finest detail is desired on the inside surface.

5) Closest registration is desired on pre-printed sheets.

6) Working with metallized material.

7) The printed matter is to be on the outside surface away from the die on opaque or translucent material or the printed matter is to be on the inside surface of transparent material.

Use the die-box method of forming into a female or negative die whenever:

1) Close dimensional tolerances are desired on the outside wall of the finished piece.

2) Maximum wall thickness is desired around the edges.

3) The finest detail is desired on the outside of the finished piece.

Summary

The vacuum forming machines that only die-box form, can do much of the same work that those equipped with the drape mechanism can do, but in many cases the setting-up is more difficult, the results less satisfactory, and the operation more expensive. Too, it has been found that there are some deep-draw pieces which cannot be done by die-box forming but which *can* be done by drape forming. Inasmuch as all the present commercial drape machines are made so that they also can be used for die-box forming into a female or negative die when desired, they become a more versatile tool that allows the forming operation to be done by whichever method is the easier and simpler, or the more satisfactory for obtaining specific results in the finished product. The drape mechanism is, without doubt, more than worth the additional cost involved.—END

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Determining

(*From pp.* 146-148)

various operations involved are simple and can be readily carried out by non-technical personnel.

A test sheet of 0.062 ± 0.003 in. thickness is prepared as follows: About 20 g. of polymer granules, powder, or fabricated items are piled on a thin polished ferrous metal plate, maximum thickness 1/16 in. (Ferrotype plates used in the photo finishing industry are very satisfactory) and covered by a similar plate (Fig. 1). Two spacers 0.075 ± 0.001 in. thick are placed between the sheets, one on each side of the molding material, at a distance such as not to interfere with the flow of the polymer. The plates are placed between the platens of a press, maintained at $250° \pm 5°$ C. ($482° \pm 9°$ F.). Sufficient pressure is applied to maintain contact of the platens on the plates (Fig. 2). The duration of this preheat period depends upon the type of material used. (See Table I). After the preheat period, full pressure is applied to the samples and held for a period of from 1 to 3 min., as indicated in Table I. This pressing schedule is designed to give a uniform, amorphous, and undegraded test sheet. The pressure required to give a sheet of proper thickness will vary with the press and should be established by trial. Immediately upon completion of the actual press period, the load is removed and the plates and plastic sheet are quenched in cold water (maximum 15° C.). The sheet is then stripped from the metal plates.

Two test strips, 2 in. long and 3/16 in. wide are cut from the pressed sheet (Fig. 3).[5] The strips are notched in the center (1 in. from

[5] A cutter for preparation of standard specimens is available from F. J. Mullowney.

Table I—Conditions for Preparation of Test Panels[a]

Kel-F[b] Grade No.	*Preheat Time*	*Full pressure Time*
	min.	*min.*
High Density Molding Powder		
240	2	2
270	3	2
300	4	2
Low Density Molding Powder		
240	2	1
270	3	1
300	4	2

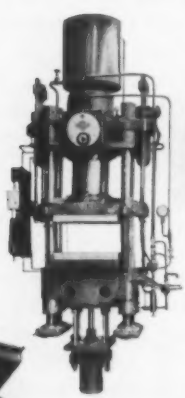
[a] In general, sheets may be prepared from molded parts by using conditions similar to those for the low density molding powder. For small specimens (2 to 3 g.), such as stripped wire coatings, a positive mold is recommended for preparation of samples.
[b] Registered trademark of The M. W. Kellogg Co. for its fluorocarbon polymers.

Table II—Dependence of ZST Upon Test Variables

Variable	*Polymer Grade[a] 240 and 270*	*300*
Temperature, % change/°C.	1	2
Notch width, % change/mil	1	2
Specimen thickness, % change/mil	1	2
Load weight, % change/0.1 g.	0.7	1.4

[a] Grade designation for Kel-F polymer.

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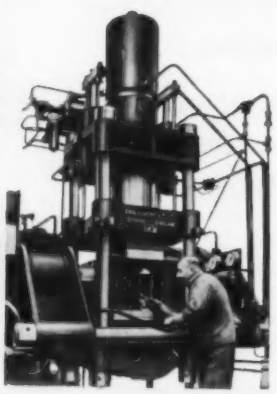
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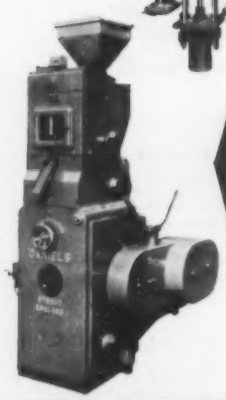
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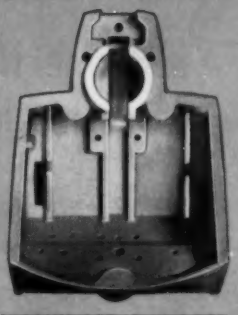
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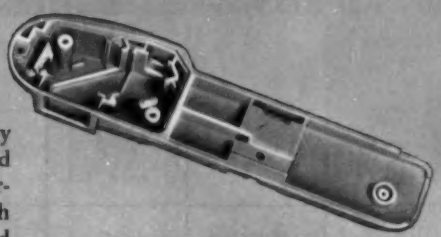
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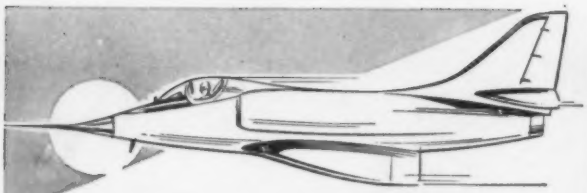
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MEF (PSI x 10^4)	DRY WET	2.7 2.5	3.34 3.15
TENSILE STRENGTH (PSI)	DRY WET	40000 38000	43260 43220
COMPRESSIVE (PSI)	DRY WET	35000 30000	36580 32640
DIELECTRIC CONSTANT (1 MEGACYCLE)	DRY WET	4.4 4.6	4.14 4.51
LOSS TANGENT (1 MEGACYCLE)	DRY WET	.045 .055	.015 .042

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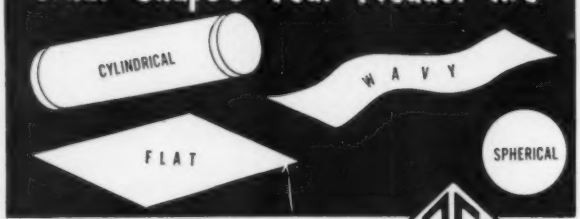
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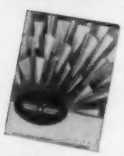
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end) using a 3/64-in. notching tool (Fig. 4). The cross section of the plastic at the notch should be 0.047 ± 0.001 in. wide by 0.062 ± 0.003 in. thick.[6] One end of each specimen is clipped into a specimen holder at room temperature; the other end is clipped to a 7.5 g. weight (Fig. 5). The specimen should be inserted into the clips until the ends of the specimen butt against the backs of the clips.

Test Procedure

The timers on the ZST apparatus are set to zero by rotating the knurled knob. The specimens are placed in the furnace, which has been brought to $250° \pm 2°$ C. ($482° \pm 3.6°$ F.). When the specimen assembly is inserted into the furnace (Fig. 6), the timers and pilot lights will automatically start. When the specimens break, the dropping weights fall into cups situated below the respective furnace holes and, in so doing, automatically stop the timers and cause the pilot lights to go out. This feature minimizes human error and does away with the necessity of continuous attention to the apparatus.

If the difference between the two time values is greater than 10% of the average, these readings are rejected and a second pair of specimens is tested. The average value in seconds is recorded as the ZST.

For correlation purposes, semi-log curves (Fig. 7) are presented relating ZST with NST and solution viscosity values; the latter were measured at 130° C. (266° F.), using 0.5 and 0.75% solutions of the polymer in 2,5-dichlorobenzotrifluoride. The non-linearity in the log ZST-NST curve above 300 NST is due to degradation during the NST measurements. The viscosity curves are linear throughout the entire range of molecular weights.

The standard deviation of ZST test results has been found to be about ± 5 percent. In general, the results for the lower molecular weight samples show standard deviations even smaller than this.

In a carefully designed statistical experiment, measurements were made on the influence of notch width, specimen thickness, furnace temperature and load weight on ZST. Results appear in Table II, p. 236.—END

[6] The notching operation shown is simplified for illustration. A notching apparatus, including a centering device, is available from F. J. Mullowney.

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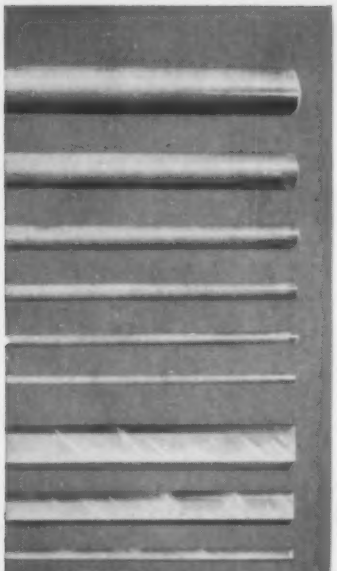
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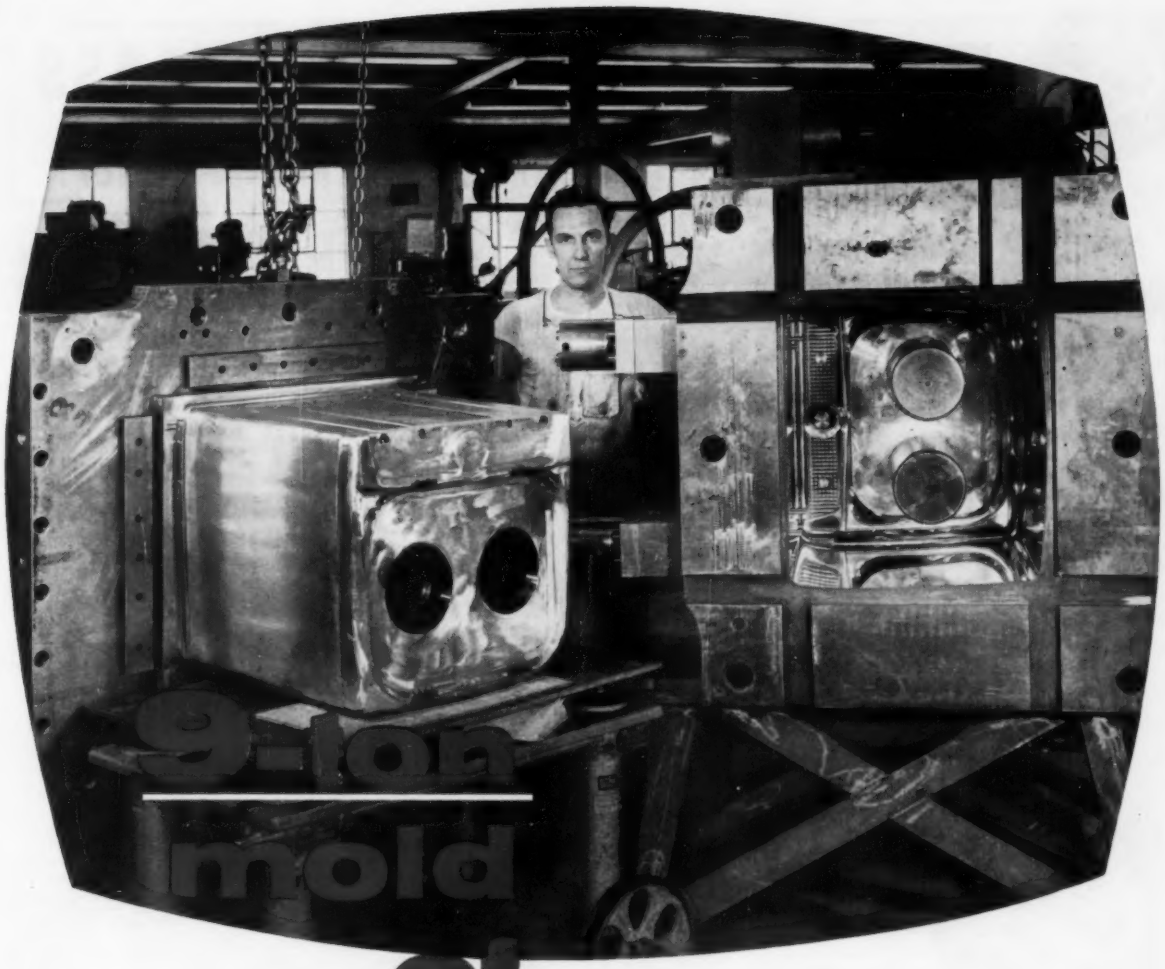
(*From pp.* 150-154)

pansion between the polyethylene and the steel distribute themselves over the entire surface. Corner welds, however, may be subjected to high thermal stresses from two directions, which is very conducive to stress cracking. The two factors necessary in stress cracking (or environmental cracking) are 1) an active chemical environment, and 2) a polyaxial stress at the point of attack, such as the stresses at right angles in a weld corner.

Active chemical environments are typified by any surface-active material such as detergents, wetting agents, plasticizers, lubricants, silicone fluids, and other types of organic derivatives (4). The effectiveness of many solutions as environmental cracking promoters is often quite doubtful, and should definitely be determined before welded polyethylene structures are used in their presence. A relatively simple test for evaluation of possible stress cracking environments is given in Agile test method 17-W (4). A welded corner specimen of ⅛-in. polyethylene sheet is placed under stress in the questionable solution at room temperature. The specimen is essentially a right angle weld of two pieces of virgin polyethylene ½ by 1½ by ⅛ in., having a triple bead corner weld of ⅛ in. diameter filler rod and a single exterior filler bead. This



Fig. 7—Cylindrical steel tank is lined with ¼ in. thick polyethylene



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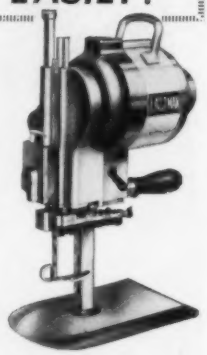
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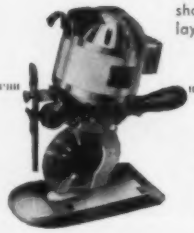
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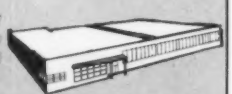


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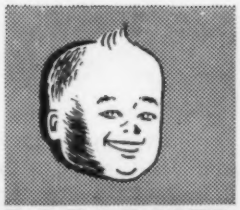


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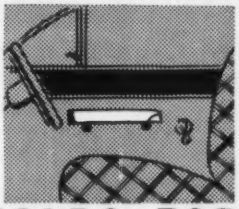
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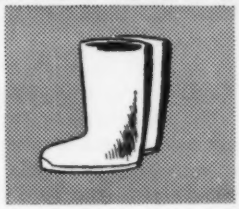
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specimen is forced under stress into a 25 mm. diameter test tube, into which the test reagent is introduced. A photograph of the specimen and tube is shown in Fig. 8. At least five tests should be made for each solution. If no failure occurs within 60 days, one is quite safe in using welded polethylene. If failure occurs, it most often takes place within a few days and appears as a fracture in the sheet immediately adjacent to the corner weld.

Complementing these tests, methods for evaluation of welding personnel are now under preparation by the Society of the Plastics Industry, Polyethylene Task Division.

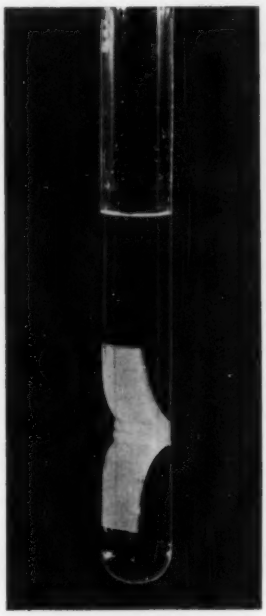


Fig. 8—Apparatus for stress cracking test according to Agile Method 17-W

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1. Neumann, J. A., "Hot Gas Welding of Plastics," MODERN PLASTICS *28*, 97 (Nov. 1950).

2. Haim, G. and Neumann, J. A., *Manual for Plastics Welding, Vol. II, Polyethylene*. 1954. Cleveland: Industrial Publications.

3. Bockhoff, F. J., and Neumann, J. A., "X-Ray Quality Control in Plastics Fabrication," unpublished manuscript.

4. Bockhoff, F. J., and Neumann, J. A., "Stress Cracking in Polyethylene Welds," SPE Journal, (May 1954).—END

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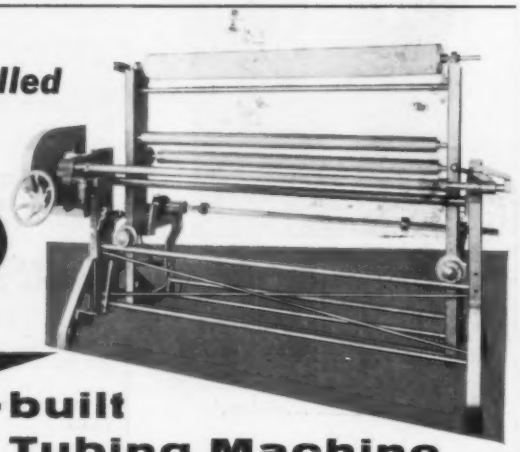
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Measuring

(*From pp.* 156-158)

ances at 6000 A. to percent transmission after correcting for theoretical reflection losses of a clear plate (fractional loss in transmission at each air-plastic interface is

$$\frac{(n-1)^2}{(n+1)^2}$$

where n is the refractive index of the plastic).[4] Yellowness was calculated by subtracting the absorbance at 6000 A. from the absorbance at 4500 Angstroms. These values are relative and have no units. The higher the number, the higher the degree of yellowness.

Changes in clarity and yellowness due to 1000 hr. Fadometer exposure are simply differences between initial and final values. Since absorbance is directly proportional to thickness, corrections can easily be made for varying sheet thickness.

Stypols *407*, *407S*, and *705S* have similar initial clarity, and are more clear than Stypols *114S* and *102*. Stypols *114S* and *102* are more yellow than Stypol *705S* which in turn is more yellow than Stypols *407* and *407S*. Due to exposure, Stypols *102* and *114S* yellow equally, and more than the others; however, Stypol *102* darkens considerably more than Stypol *114S*. Stypols *407* and *102* darken equally. Thus, darkening and yellowing of the polyester sheets are not necessarily mutually dependent.

The advantage of light-stabilizing action is obvious from inspection of the data for Stypols *407* and *407S*. Both darkening and yellowing are reduced in the light-stabilized Stypol *407S*. Stypol *705S* is superior as regards both darkening and yellowing. Initially it is somewhat more yellow than Stypols *407* and *407S*, but its change is far less. In every case a visual ordering of the specimens agreed with the calculated data.

Acknowledgment

The authors wish to express their appreciation to the Multiple Fellowship on Protected Metals sustained at Mellon Institute of Industrial Research by the H. H. Robertson Company, which has supported the work described herein, for permission to publish this material.—END

[4] See, for example, R. W. Wood, "Physical Optics", p. 411, 3rd edition, The MacMillan Co., New York (1934).

DESIGN and PRODUCTION NEWS

FOR PLASTICS AND MATERIALS ENGINEERS

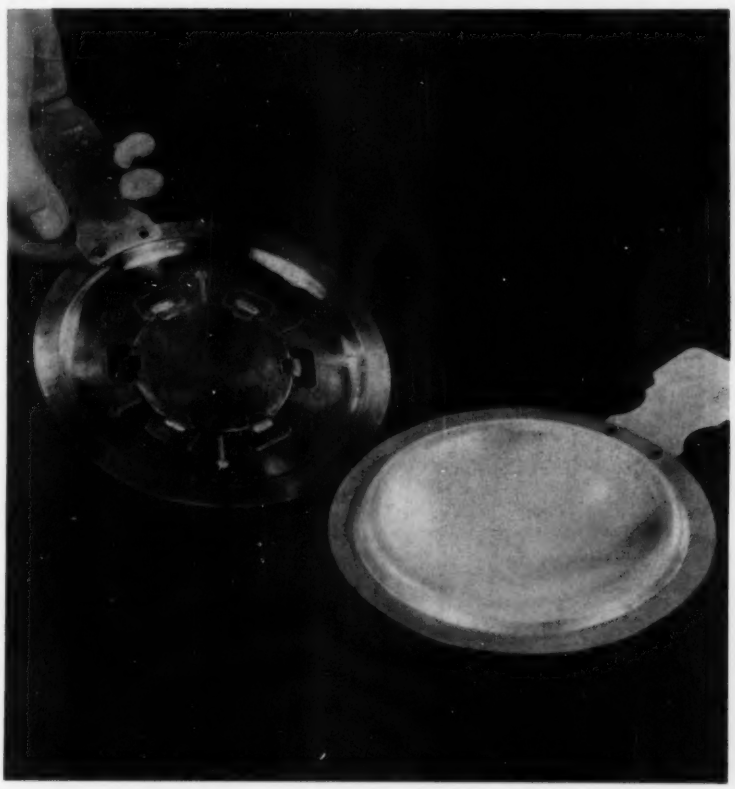
Published by TECHNICAL SERVICE, Chemical Manufacturing Division, The M. W. KELLOGG Company OCT.-NOV. 1954

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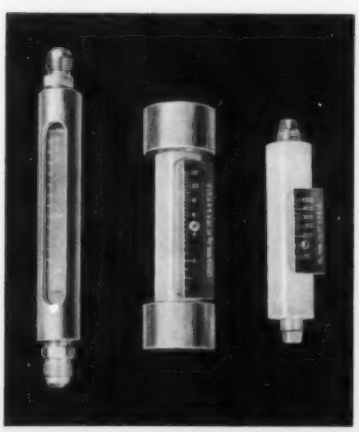
A lining of KEL-F plastic on the standard (right) and a film seal in the new "lug" type rupture disc (left) permit them to be used safely with practically all known corrosive materials, at temperatures up to 250°F.

Black, Sivalls & Bryson, Inc., Kansas City, Mo. manufacturers of special control equipment, pioneered this use of KEL-F plastic film. B S & B uses unplasticized "Trithene"* (KEL-F polymer) film produced by The Visking Corporation, Terre Haute, Ind. in many types of rupture discs.



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Chemically-inert, the plastic tubes are unattacked by the HF even at 300°F. Machined to precision dimensions, they maintain original metering accuracy. Flow tubes have remained clear to permit easy float visualization.

The Brooks Rotameter Company, Lansdale, Pa., produces these corrosion-resistant flowmeters. Flow tubes are machined of rod extruded from KEL-F polymer Grade 300 by the United States Gasket Company, Camden, New Jersey.

For further information ask for Application Report C-120

(SEE REVERSE SIDE)

® *Registered trade-mark for The M. W. Kellogg Company's fluorocarbon Polymers.*

CONTINUED FROM PRECEDING PAGE

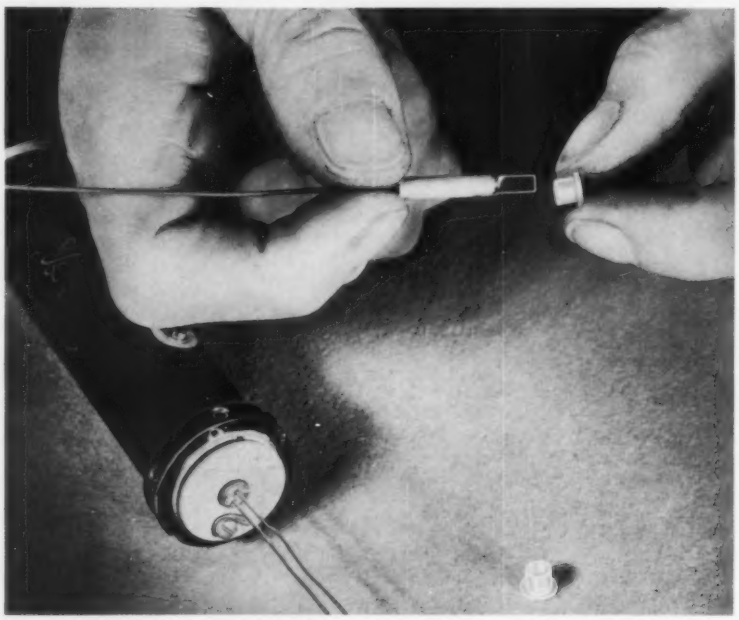
Paper-Thin Insulator of KEL-F® Polymer Solves Space, Precision "Specs" Problem in Microwave Cavity

Found to be the *only* high-frequency dielectric capable of being machined to close tolerances in this .009" thick insulator, KEL-F plastic effectively prevents pulse leaks between cavity and probe. These units, producing hundreds of watts peak power output, depend largely on the insulator for their 0.0005% per °C temperature coefficient.

The fluorocarbon's high dielectric strength over a wide temperature range and its dimensional stability assure complete insulation in the limited space provided. Zero water absorption of this fluorocarbon guards the insulator against any changes caused by moisture.

The precision insulator is machined from KEL-F polymer rod and installed in microwave oscillator assemblies by C.G.S. Laboratories, Inc. of Stamford, Conn. C.G.S. obtains its rod stock from the Resistoflex Corporation, Belleville, N. J. who extrude it from unplasticized KEL-F polymer.

For further information ask for Application Report E-127



Molders & Fabricators of the Month

Leading molders, extruders and fabricators specialize in the production of materials and parts made of "Kel-F" . . . each month this column will spotlight several of these companies with their principal services and products.

Booker & Wallestead, Inc.
Minneapolis, Minn.
Injection molding
Compression & transfer molding
(Specialize in short runs)

H & R Industries
Nazareth, Pa.
Extrusion & injection molding
Machining & forming
Rod, tube, tape & strip
Resistor sleeving

Electronic Wave Products, Inc.
New York, N. Y.
Sealing of film
Forming
Container liners; gaskets

Reiss Manufacturing Corporation
(Rway Synthetic Products Div.)
New York, N. Y.
Extrusion, compression & transfer molding
Machining & forming
Rod, tube & sheet
Gaskets & diaphragms
Valve seats

Recent Significant KEL-F Polymer Developments...

Blending equipment is now coated with "baked-on" KEL-F polymer dispersions to eliminate wasteful sticking of special plastics during processing. Chemical inertness and non-stick qualities of coating have cut maintenance and contamination.

Switch seals of the plunger type are now molded of fluorocarbon polymer to provide a hermetic seal that will withstand high altitudes and temperatures.

Valve seats machined from KEL-F polymer rod stock are used in a special valve required in nuclear research. Non-porous, tough plastic effectively keeps active Helium isotope from diffusing through the seat. Low "cold flow" keeps seats smooth and undamaged even after many "high torque" closings.

Covers for high-frequency components are compression molded of fluorocarbon polymer for electrical insulation as well as maximum visibility of contained parts. High impact strength and resistance to aging eliminates need for special protective or reinforcing shields or guards.

OFF THE PRESS . . .

Revised "BUYERS GUIDE" listing KEL-F polymer products, molders and fabricators.

For complete information regarding any item mentioned in DESIGN AND PRODUCTION NEWS, ask for detailed APPLICATION REPORTS, write

Technical Service
CHEMICAL MANUFACTURING DIVISION
THE
M. W. KELLOGG COMPANY
P. O. Box 469, Jersey City 3, N. J.
or offices in Boston, Chicago, Dayton, Los Angeles and New York

M W KELLOGG — PULLMAN

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946, of MODERN PLASTICS, published monthly at Bristol, Connecticut, for October 1, 1954.

State of New York
ss.
County of New York

Before me, Notary Public in and for the State and County aforesaid, personally appeared Charles A. Breskin, who, having been duly sworn according to law, deposes and says that he is the Publisher of MODERN PLASTICS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), to wit:

1. The names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Charles A. Breskin, 575 Madison Ave., New York City.

Editor, Hiram McCann, 575 Madison Ave., New York City.

Managing editor, A. Paul Peck, 575 Madison Ave., New York City.

Business manager, A. S. Cole, 575 Madison Ave., New York City.

2. The owner is: (if owned by a corporation, its name and address must be stated and also, immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as those of each individual member, must be given.)

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3. The known bondholders, mortgagees, and other security holders owning or holding one percent or more total amount of bonds, mortgages, or other securities are: None.

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CHARLES A. BRESKIN, Publisher

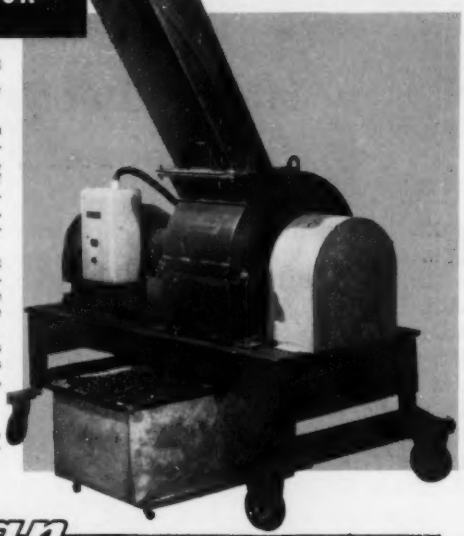
Sworn to and subscribed before me this 1st day of September 1954.

[SEAL] BEATRICE GROVE

Notary Public, State of New York
No. 31-6689250. Qualified in New York County.
Certificates filed with City Register, New York County.
Commission expires March 30, 1956

AMERICAN
KC-12
PLASTIC GRANULATOR

Granulates 500 Lbs. Plastic Scrap Per Day *Without* Replacement Parts Since Installation



Pays for Self in Labor Savings Alone, According to Owner

This American installation, with specially designed hopper for receiving long lengths of plastic hose, has been averaging over ¼ ton of plastic scrap a day since installation. The scrap includes styrene, vinyl, plexiglas, butyrate and ephocel.

On over a year of operation not one cent has been spent on replacement parts—and no maintenance other than greasing and knife sharpening.

The KC's high capacity cuts labor costs, takes an operator less time to feed scrap than smaller, less efficient granulators.

WRITE for your copy of new American Plastics Granulator Bulletin.

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

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TOUGH, resistant to chemicals, corrosion and abrasion, light in weight

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Champion of CHEMICAL RESISTANT MATERIALS
*Fabricated By PYRAMID**

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STOCK ITEMS

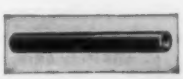
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Saran Tubing, Tube Fittings
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Easy to use—can be cut with ordinary saw—threaded with standard pipe tools. Available IPS sizes ½" to 6". SARAN PIPE NIPPLES AND FITTINGS—light weight, strong, threaded for easy assembly. Standard sizes from ½" to 2".



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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Improved Polystyrenes Seek Greater Markets

RESIN producers' programs to move more styrene-type molding materials received added impetus during the past month with Bakelite's announced completion of facilities to produce commercial quantities of high-impact polystyrenes. Previously, production had been on a pilot plant level. In addition, an over-all expansion will increase production of all Bakelite polystyrenes five-fold by the end of 1955. Along with increased quantity, the company lays great stress on the improved quality of all its styrene-type resins, including Bakelite's acrylonitrile-styrene copolymer, C-11.

Since all polystyrene producers had already proved that they could produce around 400 million lb. of styrene-type molding material a year and have added considerable new facilities since that proof was established, their marketing problems assume serious proportions. In 1953 about 300 million lb. were sold. All producers are aware of the challenge of selling 50 or 100% more in the face of growing competition from other materials, and aim to meet it by providing better material and intensified marketing programs.

High-Impact Materials—Like the other producers, Bakelite is counting on its high- and extra-high-impact rubber-modified polystyrene to contribute to the new program in substantial quantity. The company claims to have been first in the market with these higher-impact polystyrenes when it sold such material to manufacturers of toy trains in 1951. But Bakelite then had only limited facilities for polystyrene production. Now the company has new facilities in Bound Brook, N. J., specially constructed to produce rubber-modified high- and extra-high-impact material. General-purpose polystyrene production won't be appreciably expanded until late 1955. When that event takes place, the company's general-purpose polystyrene capacity will be doubled.

Emphasis on Surface Finish—Bakelite spokesmen assert that the advantages of its high- and extra-high-impact polystyrenes over competitive materials are the excellent surface finish as well as ease of molding.

The extra-high-impact material is labeled TMD2155 and supersedes Bakelite's former BMS155. It sells for 41½¢ a lb. in natural and standard colors. Its impact strength is about three times greater than regular high-impact and eight to ten times greater than general-purpose polystyrene.

The company's improved high-impact polystyrene is labeled TMD-5151. It supersedes the old BMS151. The price in carload lots is 34¢ a lb. for natural and 36¢ a lb. for standard colors. General-purpose polystyrene sells for 31½¢ a lb. in crystal.

Both the high- and extra-high-impact materials meet the customary specifications demanded for light stability; they have no odor and will not permit transfer of flavor when used in refrigerators.

Extrusion compounds of high-impact material for sheet will have the same properties as the molding compound and will carry the label TGD5001. This material has been specially formulated to meet extrusion requirements. Bakelite says that the high gloss of the extruded sheet is maintained through fabrication and obviates any necessity for post-polishing or overlaminating.

It is expected that the extra-high-impact polystyrene will find immediate large-scale use in the musical instrument and toy fields. Pipe fittings for use with plastics pipe are already being molded from the new extra-high-impact material.

Some of it will undoubtedly be used for various types of housewares where its rigidity and superlative finish give it an advantage over more flexible materials. However, it is believed that most housewares now molded in general-purpose polystyrene will change over to high-impact rather than the extra-high-impact material since the extra impact strength is not needed. Refrigerator parts are also expected to remain in high-impact; they have proved satisfactory ever since their introduction to that market.

Heat-Resistant Formulation— In addition to its three newly improved impact polystyrenes, Bakelite is also announcing an improved higher heat-resistant polystyrene that will withstand 197° F. It is labeled SMD-3000. The distortion point for general-purpose polystyrene is around 180° F. The higher heat-resistant material is suggested for such applications as radio cabinets and battery cases.

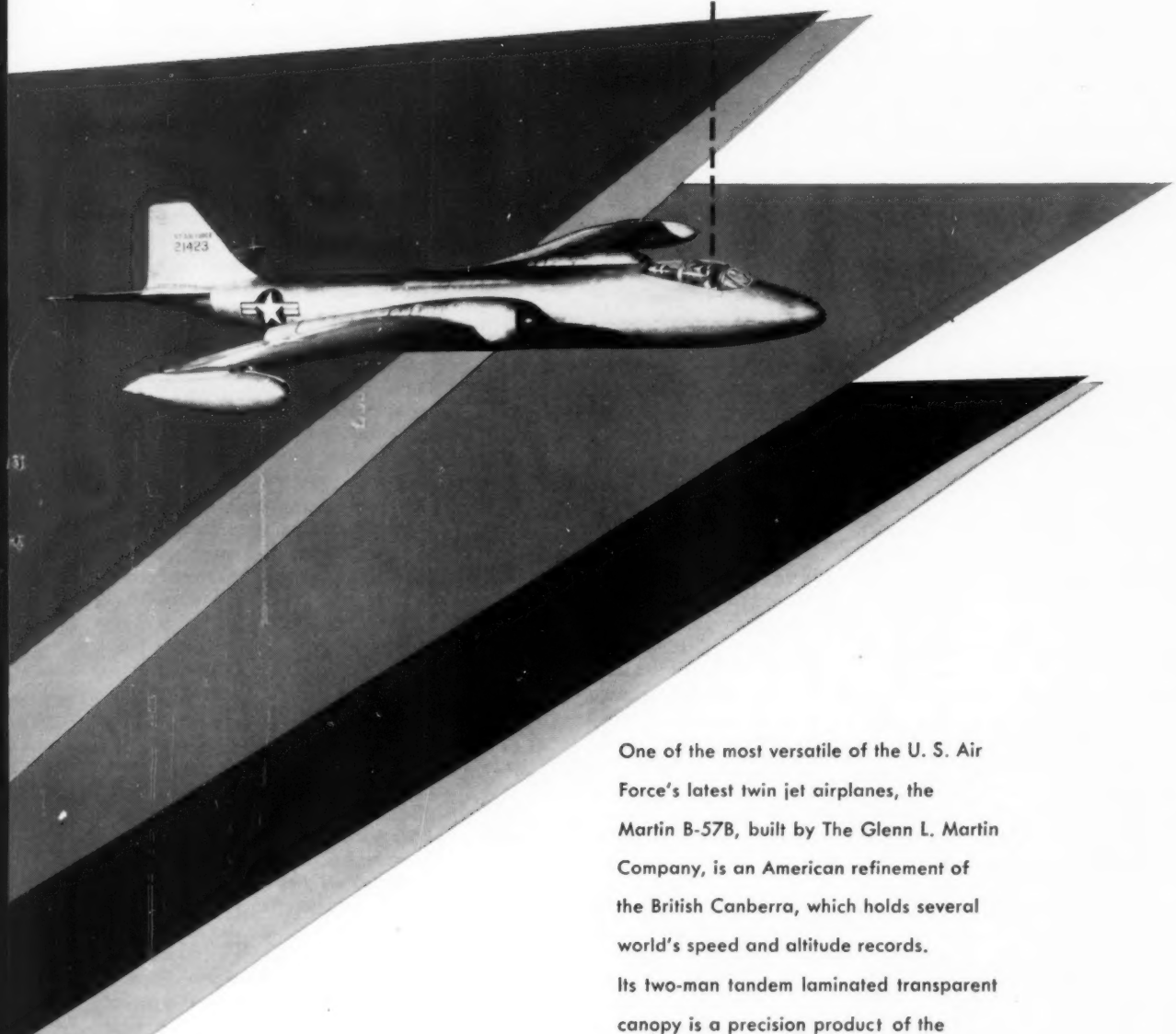
One of the reasons that Bakelite can claim improvement for all its polystyrenes is that it has improved the quality of its general-purpose polystyrene and all of them have to start from that basic material. Like other producers, Bakelite is careful not to tell just what takes place during the "improved processing" of the polymer, but the guess in the trade is that the structure and length of the molecular chain are now more uniform than they once were. Thus, when heat is applied to the molding compound, the effect is more uniform throughout the entire body of the piece being molded. However, whatever is happening, either chemically or mechanically, the result seems to be that the new general-purpose polystyrene SMD3500 has higher plasticity and faster set-up than ever before.

Faster Molding—In one field test where SMD3500 was used, time to fill a mold was decreased from 12 to 7 seconds. The increased rate of fill results in fewer and less noticeable weld lines and reduces strains. The material flows easily even through pin-point gates and dispersion nozzles, producing parts which are claimed to be relatively free from stress crazing and weld lines. One

*Reg. U. S. Pat. Off.

VISIBILITY by Swedlow

IN THE MARTIN B-57B



One of the most versatile of the U. S. Air Force's latest twin jet airplanes, the Martin B-57B, built by The Glenn L. Martin Company, is an American refinement of the British Canberra, which holds several world's speed and altitude records.

Its two-man tandem laminated transparent canopy is a precision product of the Swedlow Plastics Company.

For optical properties of exacting accuracy, the aircraft industry and the armed forces place full confidence in Swedlow's broad and specialized experience in fabricating transparent plastic glazing materials.

Swedlow PLASTICS CO.

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manufacturer reports that the number of cavities he is able to fill has increased from three to five. It is also asserted that molding pressures can be reduced by as much as 25% with no increase in set-up time and that the lower pressures permit improved release.

General-purpose polystyrene is expected to remain as one of the largest outlets for styrene-type resins for a long time to come, despite all the talk about modified and copolymer types. Its low cost, clarity, and color possibilities make it the favored material for scores of applications. Wall tile is an outstanding example. Some of the larger size tiles may be molded in modified or copolymer types of styrene. Some locations where special conditions are encountered require different formulations, but normal tile seems well established in general-purpose polystyrene. Millions of pounds are going to be sold in the future before straight polystyrene ever becomes a rarity.

Markets for C-11—In addition to their straight and modified polystyrenes, Bakelite has also announced an improved formulation of its C-11, the acrylonitrile-styrene copolymer which is labeled "RMD4001—the General-Purpose C-11 Material." The improved material is said to have much freer flowing characteristics and better clarity than former C-11 materials, without loss of physical or chemical properties. It will withstand a much more severe break or drop test than regular polystyrene and has a heat distortion point of at least 195° F., and over 200° F. in some circumstances. The material will withstand ambient temperature changes from −40 to 190° F.

However, the particularly outstanding properties of this copolymer are its chemical resistance and beautiful surface. It is less affected by such things as gasoline, turpentine, detergents, mothballs, ink, coffee, carbon tetrachloride, and many other materials that attack the surface of some plastics. Its resistance to food stains and its great strength make it an ideal material for tumblers, cups, refrigerator components, and packaging applications. There are now on the market thousands of distinguished-looking C-11 tumblers, but there ought to be millions of them. Their resistance to breaking and their sparkling beauty add sales appeal that housewives find difficult to overlook. The surface doesn't become dull or rough after much handling and is seldom if ever marred by contact with foods or most chemicals. Up to now, C-11 hasn't been used for flatware because even though it will withstand the abuse of an automatic dishwasher, it still doesn't have enough heat resistance to withstand contact with lighted cigarettes.

Since C-11 is resistant to most soaps, hair oils, tonics, and detergents without crazing or cracking, it is excellent for combs, brush backs, and cosmetic containers where its depth of color and appearance give it advantages over regular and impact polystyrene. For typewriter cases and parts, it is useful because of its resistance to the carbon tetrachloride that is used as cleaning fluid. C-11 buttons give the drycleaner less worry for the same reason. Wall tile made from C-11 would be appropriate in gasoline filling stations because of its resistance to liquids and greases that are common to such installations. Battery cases made of C-11 eliminate the creep of battery fluids which literally climb up the walls of glass cases and attack the sealing compound.

There are many other possibilities for this promising molding material which has so far been in rather limited use. Now that its molding facility has been improved, there should be more. The price should not necessarily be a severe deterrent. Large quantity lots now cost between 45 and 50¢ a pound. There is a likely probability that prices will some day be lower. Acrylonitrile, one of its chief constituents, has dropped in price from 43¢ a lb. in 1950 to 31¢ at present, and large additional quantities are coming to market in the near future. During this same period C-11 has dropped 12 to 15 cents a pound. Chances are good that C-11 is going to increase in sales volume at a much greater rate in the future than in the past.

Saran on TV

IN a daring advertising campaign that competes for time with what pollsters say is the most popular program on television, The Dow Chemical Co. has launched a program called "Medic" that is not only unique to the television stage, but also to the plastics industry. Plastics products have been taken to the consumer via television before but never in such concentrated fashion. Dow's efforts heretofore have been in programs where it shared sponsorship with other firms, but this time Dow has the whole show with its three accompanying commercials.

Readers of this column will have seen the show by the time this article is printed so they can form their own opinions on whether or not the housewife will leave Lucy to see Medic. However, optimism on the attention-getting power of Medic was certainly high among NBC and Dow officials as the first show was readied for presentation.

The entire plastics industry will be watching with great interest to see how the public reacts to this visual effort to establish a new buying habit for American housewives. A side issue will be concern over whether or not this campaign will aid in the need for teaching consumers that there are as many kinds of plastics as there are metals and educate them to the necessity of asking for a material by its generic term instead of using the word "plastic" which leaves a confused and sometimes sour connotation in the minds of many consumers who look upon all plastics as either good or bad, according to their own experience.

The Medic program commercials will be devoted entirely to Dow's saran. The company's other plastics products will be advertised on two other programs where Dow is one of several participating sponsors. There will be 38 commercials in the 13 weeks' program, 30 of which will be devoted to saran wrap with the other eight devoted to saran seat covers and carpeting.

Saran film has been going through a rather long development period, but Dow merchandisers are now confident that it is well on the way to

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ATTENTION INJECTION MOLDERS

Have you tried our crystal clear

PURGING COMPOUND?

If not, ask for full information and samples.

If you are already a regular user, better check your inventory and order today.

PLASTICS SCRAP

WE BUY

all types of plastics scrap and surplus virgin materials — in any quantity, large or small. For top prices be sure to get our offer every time you have materials for sale.

WE SELL

reprocessed and virgin plastics materials of ***guaranteed quality.*** What material do *you* need? ACETATE, BUTYRATE, POLYETHYLENE, POLYSTYRENE, both *regular* and *high impact,* ETHYL CELLULOSE, VINYLS — they all are available in reprocessed pellets, uniform in size, formulated to meet your color and flow requirements. This means real savings that count in today's competitive market.

WE CUSTOM REPROCESS

your own Plastics Scrap and Virgin Plastics Materials. Our 150,000 square feet of floor space devoted exclusively to the processing of plastics materials together with our complete laboratory facilities for testing, analyzing and pilot running enable us to offer the world's finest facilities for salvaging plastics scrap and by-products of the plastics industry.

A. BAMBERGER CORPORATION

PLASTICS MATERIALS

703 BEDFORD AVENUE, BROOKLYN 6, N. Y.

Phone: MAin 5-7450

Cable: CHEMPROD BROOKLYN

THE PLASTISCOPE

a substantial market. As a wrap for household purposes, it has achieved remarkable success since Dow started its consumer campaign in November 1952. The film wrap is distributed exclusively by food brokers through food retailers and is now stocked in food stores that represent 70% of the dollar volume of all food sold. Merchandisers consider that coverage to be a remarkable achievement in only two years' time. It is expected that the remaining 30% of the field will soon be covered.

The year 1954 is expected to be a banner year for over-all saran production. In addition to the wrap for household purposes, it has also been growing in use as a commercial wrap. Cheese was the first commodity where saran's properties were proved most practical for packaging purposes. Dried fruit followed soon after. Nut meats can be expected to retain their freshness for a long time when packed in saran. The Kraft company has announced that it is using saran liners for the closures on all its edible oil-type products. Candy is the latest product to adopt saran as a wrapping material because it doesn't stick, is a good moisture barrier, has a pleasant feel, and increases shelf life of the candy.

Saran seat covers for automobiles have been dominant in the market for some time. Saran carpeting is still new but growing nicely. Miscellaneous uses such as bristles, pipe and pipe lining, and various other uses make total volume a sizable figure, although Dow doesn't say how much. The advertising campaign would indicate that company officials expect good, substantial growth in the future.

Organic Welding Material

STRENGTH and ease of handling is claimed for Tygoweld, an organic welding material developed by U. S. Stoneware Co., Akron, Ohio. It is reported that although the welding technique does not require an open flame or arc, adhesion of metal to glass, metal to porcelain, and metal to metal have passed rugged peel and shear tests.

Most noteworthy is the fact that Tygoweld comes in rod form and can be applied with moderate heats and little or no pressure. A welding torch is unnecessary. Storage problems and aging are virtually eliminated by the rods. Also available are powder and paste adaptions of the new material. Special color and filleting characteristics further widen the range of its possible future applications.

One particularly revolutionary application is in the use of Tygoweld rod in the bonding of metal hypodermic needles to glass syringe barrels, a process heretofore difficult and expensive. Glazed porcelain insulators can be bonded more efficiently to metal and other materials by this process.

Special Preform Roving

DEVELOPMENT of a special fibrous glass roving used exclusively for preform molding of reinforced plastics products has been announced by Fiber Glass Div. of Pittsburgh Plate Glass Co., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa.

The new glass product, called Pittsburgh 508 Roving, utilizes a special sizing process to provide better chemical and mechanical bond between the glass fibers and the actual molding resin.

Monsanto Plasticizers

TWO NEW phthalate plasticizers—Santicizer 601 and Santicizer 602—for use in a broad range of polyvinyl chloride formulations are now available from Monsanto Chemical Co.'s Organic Chemicals Div., St. Louis 4, Mo.

Santicizer 601 is a fifty-fifty mixture of di-n-octyl, n-decyl phthalate (D.N.O.D.P.), and di-iso-octyl phthalate (D.I.O.P.). In most applications, its flexibilizing properties and very low volatility make it superior to di (2-ethyl hexyl) phthalate (D.O.P.) or D.I.O.P., according to H. I. Armstrong, Monsanto's manager of plasticizers sales

Santicizer 602 is a fifty-fifty mixture of di-iso-decyl phthalate (D.I.D.P.) and D.I.O.P. It imparts excellent alkali resistance to vinyl floor tile, and in other applications provides lower volatility but slightly less flexibilizing action than D.O.P. or D.I.O.P., according to Mr. Armstrong.

Monsanto also announces that its di-iso-decyl phthalate and di-iso-decyl adipate (D.I.D.A.) have been suggested as two plasticizers that may be used to produce superior resistance to soapy water extraction and alkalies.

Stamping Rigid Vinyl

INTEREST in stamping rigid vinyl sheet with conventional automatic stamping presses, a process exhibited at the National Plastics Exposition in Cleveland by B. F. Goodrich Chemical Co., has continued at a gratifying rate.

The company points out that conventional stamping presses used for metal can be adapted to produce comparable products from high-impact rigid vinyl sheet. In the initial demonstration, a 5-ton Hannifin hydraulic press was used to stamp cigarette boxes from a 0.050-in. sheet. The principal difference in the operation is that the plastic sheet must be heated to its forming temperature (260 to 275° F.) before stamping. Because of this, lower forming and cutting pressures are required for vinyl than for most metals, and thus larger articles can be made on any given press.

A continuous process may be employed by using rolls of rigid vinyl in thicknesses up to 0.04 or 0.05 inch. The sheeting may have one or both sides embossed: the forming operation does not destroy the finish. If thicker parts are desired, single sheets in thicknesses up to ½ in. may be used. The over-all time cycle for stamping cigarette boxes is 8 to 9 seconds.

Matched metal dies are used to form the sheet. Provision should be made for water cooling to remove stock heat during the forming operation and to prevent heat build-up in the molds. Products may be lifted from the mold without use of air ejection. Ordinary strip heaters were used for the heating elements at the Cleveland exhibit. Auxiliary equipment needed is a table support, stock roll supports, take-up roll supports, and pulley arrangements to provide intermittent feed. Two sets of driven rolls are necessary—one to feed the

NOW! Greater profit opportunities with new RIGID ULTRON vinyl sheeting!

Monsanto's new rigid ULTRON vinyl sheeting will stimulate a host of new, profit-making applications in the printing, lighting, and vacuum-molding fields. Here are some important product points you should know:

If you are a printer, Opaque rigid ULTRON offers razor-sharp reproduction without bleed-through because it is a pure vinyl chloride product! Puts new saleability into such jobs as advertising displays and novelties, calendar and calling cards.

If you are a lighting supplier, translucent rigid ULTRON for luminescent ceiling installation delivers greater light intensity, complete diffusion with fewer shadows, ease of installation and maintenance because it's made of vinyl chloride.

If you are a vacuum-molder, opaque and translucent ULTRON will put more sales power into your jobs. Rigid ULTRON offers you greater dimensional stability which prevents distortion of sheets under heat.

For full information on new opaque and translucent rigid ULTRON vinyl sheeting, write MONSANTO CHEMICAL COMPANY, Plastics Division, Room 2610, Springfield 2, Mass.

SEE "THE MORNING SHOW" ON CBS-TV.

Ultron: Reg. U. S. Pat. Off.

For printers and vacuum molders: OPAQUE ULTRON!



Test proves outstanding opacity! Fingers don't show through when Opaque Ultron is held in front of 500 watt light box!

For lighting suppliers and vacuum molders: TRANSLUCENT ULTRON!

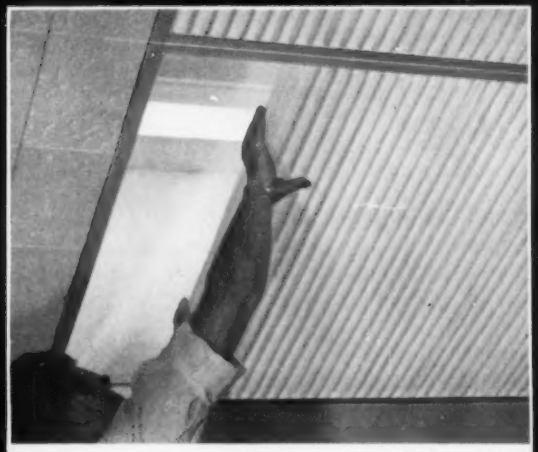


Photo shows how translucent Ultron can be handled and installed with ease! Perfect for vacuum and mechanical heat forming!

SERVING INDUSTRY . . . WHICH SERVES MANKIND

MONSANTO ®

THE PLASTISCOPE

sheet through the heater, the other to pull the sheet through the press. Cost of the entire set-up, exclusive of dies, which was built for the demonstration was less than $2000.

A partial list of applications for which the above process of stamping rigid vinyl sheet may be used would include agricultural equipment, air conditioning units, auto stampings, closures, containers, furniture parts, hospital utensils, lighting fixtures, office machine housings, packages, perforated plastics, and refrigerator parts.

Epoxy Resin Prices

A REDUCTION of 10¢ per lb. in the price of epoxy resins has been announced by Bakelite Co., a Div. of Union Carbide and Carbon Corp., 260 Madison Ave., New York 16, N Y. J. L. Rodgers, manager of the Bonding Materials Dept., states that the resins have been reduced from $1.00 to 90¢ per lb. in order to stimulate greater growth in the new markets.

Announcement has also been made by Shell Chemical Corp., 50 W. 50th St., New York, N. Y., that the price of its Epon 828 has been reduced from $1.00 to 90¢ per lb. in drums in carload lots and from $1.03½¢ to 93½¢ per lb. in lesser quantity. The epoxy resin is used for casting, potting, and laminating.

Faster Coating Technique

IMPROVED techniques for vinyl coating on fabric have been developed by the spread-coating industry over the past five or six years, but management is still seeking further improvement in methods that will produce even better results.

New equipment for drying the coated material has been highly recommended to this column by several sources. It is manufactured by F. C. Dawson Engineering Co., Canton, Mass., and includes four types of machines particularly adaptable to vinyl coating or embossing operations. They are Vapo Fusers, preheaters, solvent dryers, and a booster for drying ovens. These machines are widely used in the printing industry for quick drying of inks, solvents, abrasives, and adhesives; setting phenolic resins; vulcanizing rubber sheets; and, in fact, wherever a coating job is done on fabric, paper, rubber, and the like.

In the Vapo Dryer, low-pressure steam passes through a number of superheating tubes, where it comes into contact with electric heating elements. From these tubes the steam passes into a number of distributing tubes and is then driven against the moving web through small openings at a velocity controlled by the initial steam pressure. Since heating is by direct contact with the hot vapor, heat transfer is highly efficient and can be closely controlled to remain constant at any point between 400 and 950° F.

Heated by Conduction—A vinyl coating for fabric is thus heated by conduction from a concentrated blast of superheated vapor. The efficiency of heat transfer is very high and the coating is thoroughly fused before the fabric backing or web can be damaged. When using Dawson equipment, it is possible to apply a thicker coating, thus eliminating a pass through the heating oven and so reducing the time required to make multiple coatings; if desirable, a number of thin coatings can be applied but at greater speed than usual.

One of the Dawson machines, the Vapo Booster, can be attached to already installed heating ovens so that additional heat can be concentrated on the web at the dry end so that a thicker coating can be applied and the web speed increased.

The use of steam removes the fire hazard often present in coating and solvent operations. In certain installations where the explosion hazard is not present, these same machines can be used with low-pressure air instead of steam.

Plax Sells Part of Business

ANNOUNCEMENT has been made by Plax Corp., Hartford, Conn., that its entire production equipment, applicable patents, etc. for extruding rods and tubes made of methyl methacrylate, polyethylene, polystyrene, and fluorocarbon (Kel-F) and for molding heavy-gage sheets of polyethylene, polystyrene, and all gages of Kel-F has been sold to Westlake Plastics Co., Lenni Mills, Pa. The transaction includes a large stock of finished products (created in anticipation of temporary production shut-down), Plax' manufacturing "know-how," and patents controlling the Lubo-Film process for extruding rods and tubes and the Liquo-Temp process for annealing all products.

Plax has sold this part of its operation to provide needed space and permit concentration on its rapidly growing squeeze bottle, extruded film, and oriented sheet businesses.

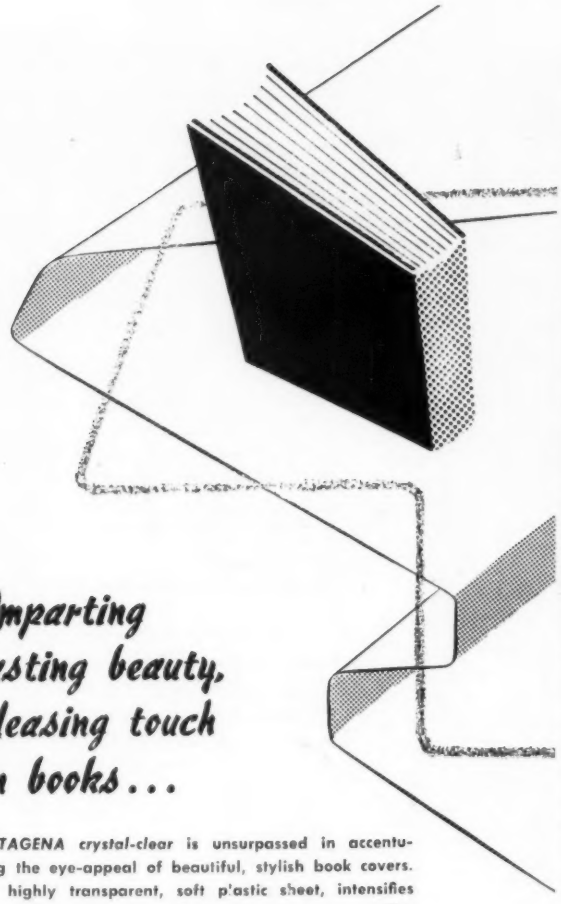
Collapsible Tubes

CONSIDERABLE progress is reported in the development of markets for polyethylene collapsible tubes and cylindrical squeeze-to-use bottles by Bradley Container Corp., Maynard, Mass. Organized by Bradley Dewey, founder and former president of Dewey & Almy Chemical Co., the company was joined early this year by Henry Griffith, former general manager of Plax Corp., as vice president in charge of sales. Bradley Container is reportedly developing markets that seem particularly adaptable to the polyethylene "squeeze" type of tube or bottle treatment.

First product to be packaged in Bradley tubes was library paste where the non-sticking properties of polyethylene eliminated the messy handling which was formerly impossible to overcome. Another product is synthetic saccharine, in liquid form, packed in small controlled one-drop tubes. Tiny tubes containing hand lotion and deodorant are being supplied for a child's cosmetic kit.

In addition to the tube, Bradley is producing a cylindrical bottle that can also be squeezed if desired. Containers in ⅗-qt. size for lubricating compounds are now being tested. Other applications for the bottle are antiseptic ointment, talcum powder with a puffer-type closure, and a rust inhibitor with a brush-type applicator.

The tubes so far produced average about ⅞ in. in diameter and are 4½ in. long, except for the tiny ones used in one-shot applications. The bottles are about 1½ in. in diameter and 4½ in. long but can be made smaller or larger. The walls



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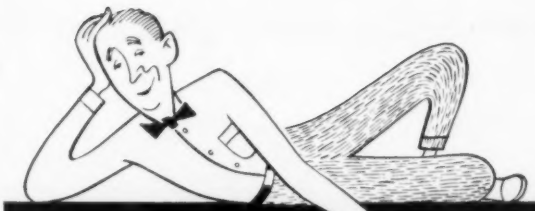
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are approximately 1.2 to 3 mils thick. The containers are filled from the bottom by the packager. The tubes and bottles are printed by offset and so far at least there is no indication that the ink will rub off.

Producers assert that their method of manufacturing tubes and cylindrical bottles permits more satisfactory printing but don't say why. Trade sources guess that the reason may be that the cylindrical tubes are printed while on a mandrel during the manufacturing operation, permitting printing while the polyethylene is resting on a solid base.

The containers are manufactured by a combined extrusion and fabricating process, details for which are not yet available.

The producers are well aware that not all products can be packaged in polyethylene because of a tendency for polyethylene to permit migration of certain types of essential oils, but it is possible that a new coating now under consideration will prevent such migration in the not too distant future.

Dow's Annual Report

THE ANNUAL report of The Dow Chemical Co.'s sales income for the fiscal year ended last May 31 reveals that 32% of the company sales were for plastics. Chemicals accounted for 57% and magnesium for 11% of the total income. Company sales of $428,255,000 were 0.5 of 1% short of the record high posted in the fiscal year 1952.

Dow reported 59 pilot plant projects in current operation, 11 of which are concerned with products entirely new to the industry.

S.P.I. Convention Cruise

VISITS to Havana, Cuba, and Nassau, B.W.I., will be on the itinerary of the cruise ship *Queen of Bermuda* on which the 1955 annual conference of The Society of the Plastics Industry, Inc. will be held. The ship will sail from New York on Saturday, May 7, at 3:00 P.M. and return on Sunday, May 15.

Business sessions will be devoted to management and technical subjects. Industrial relations, in-plant training, safety, fire prevention, and economic trends in the industry will be discussed.

Chairmen of the various committees are as follows: Convention and Cruise Committee—C. J. Groos, vice president of Boonton Molding Co.; Entertainment Sub-Committee—B. Schiller, vice president of Banner Plastics Corp.; and Program Sub-Committee—Alan S. Cole, executive vice president of Breskin Publications, Inc.

Rigid Vinyl Pipe Fittings

A PATENTED process of injection molding of unplasticized polyvinyl chloride will be used exclusively by the recently organized Tube Turns Plastics, Inc., 224 E. Broadway, Louisville 1, Ky., in the manufacture of plastics pipe fittings and custom molded products. With an investment of $1.5 million, the new company was established jointly by Tube Turns Div. of National Cylinder Gas Co. and Jackson & Church Co.

Tube Turns Plastics is presently claimed to be the only source of injection molded P.V.C. fittings as a result of the acquisition from Jackson & Church of the first injection molding machine and techniques for manufacture of these fittings on a commercial scale. The manufacturing operation involves a patented preplasticizing process originally developed by James W. Hendry, Jackson & Church vice president and a leading authority on plastics.

The new firm will also make fittings and custom molded products from other thermoplastics and thermosets. It is expected that the fittings will be marketed through mill supply houses, pipe jobbers, and similar channels.

Officers of Tube Turns Plastics are as follows: David L. Perrot, chairman of the board and executive committee of Jackson & Church, has been elected board chairman; George O. Boomer, president of Tube Turns Div. and chairman of the executive committee of National Cylinder Gas, has been named president. He is also president of The Girdler Co., another division of National Cylinder Gas. Carl McLaughlin, formerly assistant to the executive vice president of Tube Turns, has been elected executive vice president. James W. Hendry and John G. Seiler have become vice presidents. Mr. Seiler is executive vice president of Tube Turns Div.

Foamed Vinyl

DEVELOPMENT work with Elastomer Chemical Corp.'s patented continuous foam vinyl process will be conducted by B. F. Goodrich Chemical Co. as a result of a license granted to the company. J. C. Richards, vice president-sales of BFG Chemical states that its technical staff is prepared to render service to other licensees on the application of Geon vinyl dispersion resins to this process.

In the Elastomer process, inert gas is dissolved under high pressure in a vinyl plastisol. The plastisol is then released through a spray nozzle to foam into a mold or onto a casting surface; it is then fused to form the finished product.

The process can be used for the production of continuous sheet as well as molded items. Among the many products which can be made by the Elastomer method are automobile and furniture cushioning, soundproofing and insulating material, mattresses, and rug backing.

Plastics in Building

A CONFERENCE on "Plastics in Building," stressing the importance of plastics in home, industrial, and institutional construction will be conducted by the Building Research Institute at the National Academy of Sciences, Washington, D. C., on October 27 and 28.

The meeting is the first of its kind and stresses the growing importance of plastics for structural purposes. Sponsors are The Society of the Plastics Industry, Inc., Manufacturing Chemists' Assn., and the Building Research Advisory Board.

Extruded Plexiglas Sheets

IMMEDIATE delivery of Plexiglas in extruded sheets is being offered by Cadillac Plastic Co., 15111 Second Ave., Detroit 3, Mich. The company claims that the sheets are lower in price than the cast sheets, yet offer many of the same advantages.

Extruded Plexiglas sheets in clear, transparent, and translucent white

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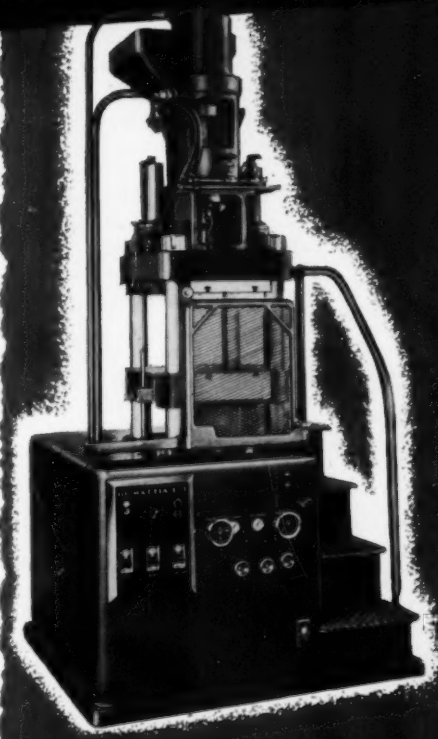
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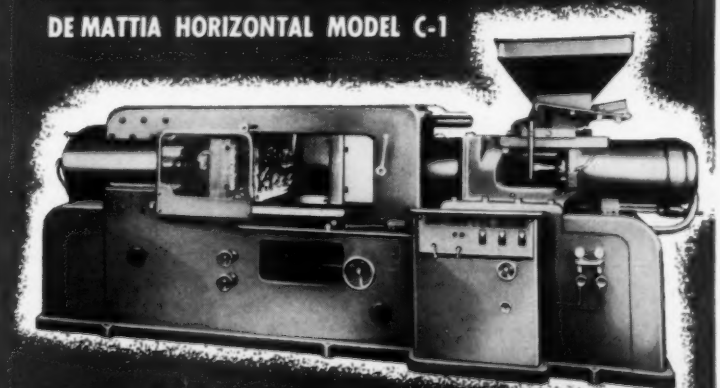


DE MATTIA VERTICAL MODEL G-1

SPECIFICATIONS

Ounces Molded per Shot — 4 (Styrene); Pounds of Plastirized Material per Hr. — 50; Capacity of Feed Hopper (Lbs.) — 50; Diameter of Injection Plunger — 1 7/8"; Diameter of Hydraulic Injection Cylinder — 8½"; Pressure on Material — 20,500 lbs. per sq. in.; Size of Die Plates — 14" x 23"; Mold Opens — Stroke — 15"; Max. Daylight — 19"; Min. Die Space — 4"; Motor — 20 HP @ 1,200 RPM; Pump Capacity — 54 GPM @ 1,000 PSI; Mold Closing Pressure (Tons) — 150; Floor Space Required — 47" x 59" — Height Over All — 108"; Approximate Wt. of Machine (Tons) — 4¼; Injection Piston Stroke — 7¼"; Closing Cylinder Bore — 8 1/16"; Complete Injection Time (Max.) — 1.88 Sec.; Heating Cylinder — 4,350 Watts.

DE MATTIA HORIZONTAL MODEL C-1



SPECIFICATIONS

Material per Injection — 12 ozs.; Plasticized Material per hour — 130 lbs.; Feed hopper Capacity — 60 lbs.; Injection Piston Diameter — 2¾"; Injection Piston Stroke — 11½"; Hydraulic Injection Cylinder Bore — 13"; Pressure on Material — 22,500 PSI; Mold Closing Pressure — 400 Tons; Max. Mold Size — 18" x 25"; Max. Daylight — 30"; Min. Die Space — 6"; Max. Stroke — 24"; Oil Pump Capacity — 60 GPM @ 1000 PSI, Max.; Motor — 30 HP; Injection Stroke Time, for Filling Mold — 3.0 Secs.; Speed of Injection Piston, Forward — 120" per Min.; Heating Cylinder — 13,000 Watts; Height of Machine, Overall — 72"; Floor Space Required — 172" x 42"; Approx. Weight — 10 Tons.

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are available in thicknesses of 0.060, 0.080, 0.100, and 0.125 in., in widths from 36 to 48 in., and up to 96 in. in length.

Cadillac reports that these sheets have been thoroughly tested for outdoor weathering and are recommended for all types of outdoor as well as interior application. Although the optical quality of the sheets is not equal to that of cast sheets, they are satisfactory for many applications and are ultra-violet absorbent. In forming characteristics, the extruded sheets are similar to that of the cast sheet.

Full information on the forming technique of the extruded material will be furnished upon request to the company.

One Hundred Years Old

A MEMBERSHIP plaque from The Hundred Year Association of New York, Inc. has been presented to the Barrett Div. of Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. Barrett thus became the 248th member in the group.

Barrett's history began when Samuel E. Barrett of Keene, N. H., moved to Chicago to join a relative, Benjamin F. Barrett, who conducted a roofing business in Chicago. Samuel Barrett started out as a salesman trying to push the then new coal-tar pitch roofing. Samuel later took over from the local gas company its entire supply of coal tar which at that time was causing the utility a lot of trouble because of fouling of sewers and rivers.

Today Barrett's diversification takes its products to fields far apart from the road and roofing needs it primarily served in the past. Its creosote protects railroad ties, telephone and telegraph poles, fence posts, and dock and bulkhead timbers. Its chemicals enter many finished products in the fields of pharmaceuticals, plastics, paints, varnishes, soaps, dyestuffs, printing inks, paper, insecticides, electrical parts, automobile and appliance finishes, resin glues, and polyester resins.

In 1920 Barrett was merged with General Chemical Co., Semet-Solvay Co., Solvay Process Co., and National Aniline & Chemical Co. into what is today known as Allied Chemical & Dye Corp.

New Diisocyanates

SEMI-COMMERCIAL production of two new diisocyanates—Todi (bitolylene diisocyanate or 3,3′-dimethyl-4,4′-biphenylene - diisocyanate) and Dadi (dianisidine diisocyanate or 3,3′ -dimethoxy-4,4′-biphenylenediisocyanate) has been announced by Carwin Co., North Haven, Conn. Drum quantities of these products are currently available at reasonable prices; larger quantities can be supplied on short notice.

Among uses of Todi and Dadi which have received attention are the manufacture of adhesives, fibers, and elastomers and resins for molding and coating applications, as well as the chemical modification of polyesters, drying oils, natural and synthetic fibers, paper and leather.

The company states that with the development of an economical source of Todi and Dadi, the rapidly developing field of isocyanate technology has two new materials for widening their application scope.

Boron-Filled Polyethylene

A BORON-FILLED plastic, recently announced by Allied Resinous Products, Inc., Conneaut, Ohio, under the name Boronol, is comprised of polyethylene and various boron-bearing compounds, such as boron carbide and boron oxide. It was developed for use in the field of nucleonics and reactor design. Boron is reputed to give high heat resistance to the plastic; the amount of the boron-bearing constituent which is added to the polyethylene is dependent upon the end use. It has been as high as 50% and could be higher if warranted. Thus, this material is not stocked but is made up to the customer's specifications on order. The formulations, in color or natural, can be fabricated into finished articles and formed in the same manner as polyethylene.

Allied is also fabricating large size sheets, plates, and billets of polyethylene for the market. One of its molded disks weighed 300 pounds. A combination molded and fabricated piece weighed 600 pounds. The company now has both polyethylene and Boronol in these large sizes for the civilian as well as the Government markets and suggests that they may be useful in fabricating large industrial equipment. Formulations can be furnished in various molecular weights, in fire-resistant material, and in polyethylene-polyisobutylene compounds.

Rigid Vinyl Sheet

PRODUCTION of rigid Ultron vinyl sheets recommended for advertising specialties, display decorations, and calendar cards has been announced by Monsanto Chemical Co.'s Plastics Div., Springfield, Mass.

The material, designated as Ultron R 309, is available in matte finish opaque white for the printing industry and in calendered translucent white in various gages. It is also recommended for use in corrugated strips for fluorescent light diffusion.

Phosphorescent Pigments

SEVERAL new Violite pigments have been developed by Rhode Island Laboratories Inc., 100 Pulaski St., West Warwick, R. I. The new pigments are of the phosphorescent type and are claimed to be particularly suitable for use with thermoplastic resins.

Data sheets on the new Violite pigments may be obtained from the company upon request.

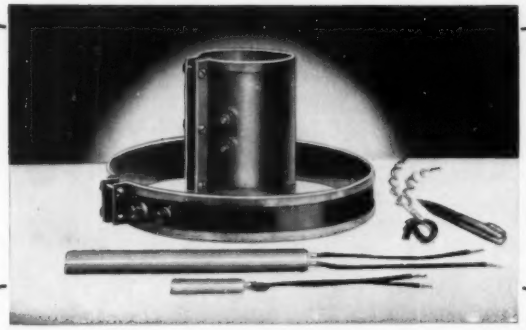
Plastic Pipe Progress

AT A RECENT meeting of the Thermoplastic Pipe Div. of The Society of the Plastics Industry, Inc., William L. Hess, vice president of Anesite Co., Chicago, Ill., and president of Plastic Pipe & Tube Corp., Santa Barbara, Calif., was unanimously re-elected chairman of the group's executive committee.

In discussing the industry's progress in establishing standards for plastic pipe, Mr. Hess pointed out the exceptional strides that have been made in expanding the use of plastic pipe throughout the industry. "A typical example," stated Mr. Hess, "is the progress made in the waterworks field, following exhaustive tests by the National Sanitation Foundation Testing Laboratory at the University of Michigan. Tests disclosed that the water extracted no objectionable substances from plas-

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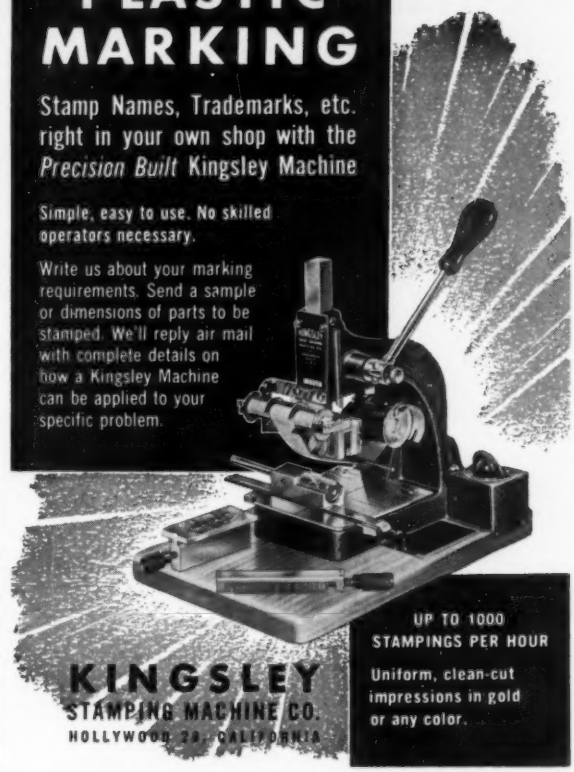
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tic pipe submitted as suitable for use with potable water. Also, samples buried in acid soil for one year showed slight color changes and minor film formation, less than occurs in copper tubing or galvanized steel pipe.

"Plastic pipe submerged partially in aggressive water," continued Mr. Hess, "showed little, if any, effect. There was no identifiable taste or odor after long exposure. Furthermore, the water passing through plastic pipe created no health hazard as indicated by tests made on white rats."

EXPANSION

The Dow Chemical Co., Midland, Mich., has established a new associated company to manufacture its Styron for molders in the British Isles. The company, incorporated as **Distrene Ltd.**, is jointly owned by Dow and **The Distillers Co., Ltd.** of Edinburgh, Scotland.

Dr. Leland I. Doan, president of Dow, states that the new company, in which Dow has a 45% interest, will build a plant at Barry, South Wales. Production of Styron is expected to begin the latter part of 1955. The plant will produce two forms of Styron—general-purpose molding granules (Styron 666) and high-impact strength granules (Styron 475).

Distillers entered polystyrene and phenolic resin manufacture in 1940 and has extensive plastics operations in the British Isles. Dow started making Styron in the late '30's.

Distrene's board of directors includes three Dow executives—N. R. Crawford, president of Dow Chemical of Canada, Ltd., a Dow subsidiary; Dr. William H. Schuette, manager of plastics production; and A. E. Young, an assistant manager of the Plastics Dept. Distillers Co. executives named as directors are Major C. J. P. Ball, H. H. Woolveridge, P. A. Delafield, and Dr. J. J P. Staudinger.

Du Pont announces that a sales development and technical service laboratory, to be built in Wilmington, Del., at an estimated cost of nearly $1 million, is expected to be ready for occupancy by the end of 1955.

The new laboratory will expand Du Pont's service to customers in applications and use of cellophane, acetate, and polyethylene films, Mylar polyester film, cellulose sponges and sponge yarn, and cellulose bands. The program also includes investigation of industry's need for new types of films.

National Aniline Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y., announces that the maleic-anhydride-fumaric acid unit in its new Moundsville, W. Va., plant is now on stream. The new unit is believed to be the world's largest producer of maleic anhydride tablets and fumaric acid crystals. Last February, the first unit of this plant was put into operation to produce aniline.

The new Moundsville plant is assured of an ample supply of basic materials from within the Allied Chemical group and can be expanded quickly, as market demand increases.

Bigelow Fiber Glass Products Div., Bigelow-Sanford Carpet Co., Inc., 140 Madison Ave., New York 16, N. Y., announces the installation of additional production lines which more than double the division's current output of glass mat.

The new production lines include equipment capable of producing glass mat, mechanically bonded, up to 84 in. in width. The company claims that this is the first time any mat this wide has been made available. The mats range in weight from 2 to 8 oz./sq. foot.

Majestic Molded Products, Inc., 845 E. 138th St., Bronx 54, N. Y., has completed the addition of facilities for assembly and finishing operations on the present premises. The company specializes in the injection molding of large projected area parts up to 200 oz. in weight. Al Axel, formerly assistant manager of industrial sales of Ideal Plastics Corp., has been named director of sales.

Plastylite Corp. is building a larger plant on North Dr., North Plainfield, N. J., where it will continue to operate as custom molder of phenolic, urea, and melamine products, and extruder of vinyl. The company will also continue custom molding of long-playing 78-r.p.m. plastics phonograph records.

H. M. Weinraub, president of Plastylite, will be in charge of plant operations and Robert J. Goldstein will remain in charge of sales and personnel.

COMPANY NOTES

Glass Fibers, Inc., Toledo 2, Ohio, announces the establishment of its **Western Div.** at 3115 Van Owen Blvd., Burbank, Calif., which will assume full responsibility for administrative, manufacturing, and sales activities in 11 western states. **M. Dean Worcester**, vice president of the company, has been appointed general manager of the new division with headquarters in Burbank. He had formerly been general manager of the firm's Burbank Div. which now becomes a part of the Western Div. **John T. Podorean**, formerly general sales manager of the Burbank Div., is now general sales manager of the Western Div.

Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y., has appointed five new technical salesmen as the initial members of a new sales group in order to expand its marketing program for the sale of Epon resins for coating and structural applications. The five appointees will headquarter in Detroit, Mich.; Cleveland, Ohio: Chicago, Ill.; Newark, N. J.; and New York, N. Y.

Spencer Chemical Co., Dwight Bldg., Kansas City 5, Mo., forthcoming producer of polyethylene, reports the following changes in personnel: **J. R. Riley, Jr.**, vice president in charge of sales, has resigned from that position but will continue as a consultant, director, and member of the executive committee. **J. E. Culpepper** has been elected vice president and will continue to serve in his former post as general sales manager. **Harold R. Dinges**, formerly director of product sales, has been named assistant general sales manager. He joined Spencer in 1947 as manager of industrial chemical sales. **George V. Taylor**, director of sales development, has become director of product sales. He joined the company in 1942 as foreman of the am-

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monia department and has served in various capacities, the latest as director of sales development. **E. W. Segebrecht**, assistant to the general sales manager, has become director of sales development. He joined Spencer in 1952 after serving in a research and development capacity with the chemical division of Armour & Co.

Lion Extruding Corp., 33 Avenue P, Newark 5, N. J., has been formed to manufacture extruded acrylic, vinyl, and acetate rods up to 1¼ in. in diameter.

Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15, Ohio, has moved its New York office to 1123 Broadway. **B. J. Moslo**, vice president of the company, continues as eastern representative with headquarters at the New York office.

PharmaPlastics, Inc., 205 S. Smallwood St., Baltimore 23, Md., has been recently formed and will engage primarily in the production and sale of plastics specialties for the drug and pharmaceutical industries. **Warren Richards** is president of the company and **Joseph W. Parker** is vice president. Both officers were formerly associated with Plastic Assembled Products Co., Baltimore.

Libbey-Owens-Ford Glass Co. has moved its eastern regional sales offices to new and larger quarters at 99 Park Ave., New York 16, N. Y.

Pelsen Tool & Die Co., 25 Sterling St., Clinton, Mass., announces the opening of a completely modern tool and die shop, specializing in injection molds, tools, dies, jigs, and fixtures. At present, Pelsen is engaged in the production of beryllium castings for injection molding. The company's service includes the entire New England area as well as New Jersey and New York.

Duraglass Laminates, Inc., 341 Madison Ave., New York 17, N. Y., is a new company organized to take over the production operations which were conducted by **Linzmeyer Development Laboratories** before the latter moved to Long Beach, Calif. All assets, inventories, and equipment of Linzmeyer have been assigned to Duraglass and all work in progress will be completed by them.

L. Linzmeyer remains as vice president in charge of engineering. Duraglass Laminates is now affiliated with **Zinvar Corp.**, and **J. T. Hamilton**, vice president of that company, is also president of Duraglass.

Eclipse Plastic Industries has opened its new plant just outside Sarasota, Fla., on the Tamiami Trail. The company will extrude a complete line of plastics pipes, tubes, and rods, packaging films and sheets, and vacuum formed sheets for the display and advertising fields.

E. G. Engman is president and general manager of the firm. Mr. Engman previously operated the Eclipse Moulded Products Co. plant in Milwaukee, Wis., and after a merger was president and general manager of General American Transportation Corp.'s Plastics Div., Chicago, Ill.

Westinghouse Electric Corp.'s Micarta Div., Pittsburgh 30, Pa., announces that **S. F. Davies** has been appointed sales manager and **C. B. Leape** engineering manager of the division.

Plastic Enterprises, 124-14 22nd Ave., College Point, N. Y., is newly engaged in vacuum forming of all thermoplastic sheet materials. The company makes its own temporary and permanent molds and offers engineering advice on the fabrication and design of products.

United States Plywood Corp., 55 W. 44th St., New York 36, N. Y., has acquired **Canadian Plywoods Ltd.**, the largest independent wholesale plywood distributor in Canada.

Canadian Plywoods has a plywood warehouse distributing unit in Montreal which, together with United States Plywood subsidiary's unit at Toronto, will now be operated as **Weldwood Plywood Ltd.**, a wholly-owned subsidiary of United States Plywood Corp.

Frank W. Egan & Co., Bound Brook, N. J., designer and builder of paper converting and plastics machinery, has named **ER-WE-PA**, Erkrath bei Düsseldorf, Germany, as its licensee. ER-WE-PA has been established as machinery builders in the paper industry in Germany and will build paper converting and plastic equipment under the new agreement to Egan drawings and designs.

Egan is also represented in England, France, and Italy by **Bone Bros. Ltd., Achard-Picard, Remy & Cie**, and **Emanuel & Ing. Leo Campagnano**, respectively.

Vacuum Forming Corp., Port Washington, N. Y., has appointed a new Canadian sales representative—**F. F. Barber Machinery Div. of Massey-Harris-Ferguson, Ltd.**, with offices at 187-191 Fleet St. W., Toronto, Ont., and branches in Montreal, Windsor, Hamilton, and Vancouver.

Cumberland Engineering Co., Inc., producer of granulators, dicers, and other plastics-reducing machinery, has moved its offices and manufacturing facilities to a new location at Roosevelt Ave. and Cole St., Pawtucket, R. I. The new location is a portion of the plant formerly occupied by H & B American Machine Co. This is Cumberland's third move to larger quarters since its inception in Tennessee in 1939.

Homer Kenyon Sales, 3322 E. Mt. Morris Rd., Mt. Morris, Mich., announces the purchase of a Hydro-Chemie Form-Vac vacuum forming machine and has entered the field of custom vacuum forming. **Homer Kenyon, Jr.** is owner and general manager of the new firm and **Homer Kenyon Sr.** is sales manager.

Metallizing Engineering Co., Inc. has moved its eastern offices, factory, and warehouse from Long Island City, N. Y., to 1101 Prospect Ave., Westbury, N. Y.

Dewey & Almy Chemical Co., Cambridge 40, Mass., announces the appointment of **Donald B. McCammond** as assistant to the vice president-general sales manager and **Paul Y. Clinton** as a member of the administrative sales staff for specific assignments on sales analysis. Mr. McCammond was formerly eastern manager of public relations of Monsanto Chemical Co.

National Vulcanized Fibre Co., Wilmington, Del., announces the merger of its **Fibre Specialty** and **Phenolite Divs.** Located in adjacent areas at Kennett Square, Pa., the two

plastic dials—emblems—toys

all look better metalized!



Metalizing makes them glitter, makes them best-sellers. If you want effects like these . . . metallic effects mass-produced at the lowest unit cost, see Metaplast, the industry's foremost pioneer in metalizing on plastics, metal and glass.

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divisions have been combined as the Kennett Plant, of which **William H. Harbaugh** and **John T. Bishop** have been appointed manager and assistant manager, respectively.

Ekco Products Co., 1949 N. Cicero Ave., Chicago, Ill., has acquired **Adams Plastics Co.**, Holyoke, Mass., which will become a wholly-owned subsidiary of Ekco, producer of housewares and commercial baking equipment.

Adams is a fabricator of compressed wood. The company's best known tradename is Pakkawood, which is used primarily for making cutlery, kitchen tools, and tableware handles. In addition, the company manufactures a variety of plastics items, as well as accessories for textile machinery.

Adams occupies a 30,000-sq. ft. plant in Holyoke and employs 100 persons. Plans are being formulated for the expansion of plant facilities and equipment to fill Ekco's own requirements.

George Alderman, who will concontinue as general manager of Adams, has been made a vice president of that firm. **Samuel Resnic**, former owner of Adams, will continue his association with the company.

Pacific Plastics Co., 2727 Seventh Ave. S., Seattle 4, Wash., has named **Albert N. Schrieber** president of the company. He succeeds **Calhoun Shorts** who will give his time as chairman of the board of directors to policy studies in product development and research.

The company operates three reinforced plastics plants in the Seattle area. The main plant in Seattle concentrates on aircraft parts, the Kent plant manufactures reinforced plastics boats, and the Bellevue plant produces plastics panels.

Slip Ring Co. of America has moved to its new building located at 1654 Lincoln Blvd., Santa Monica, Calif. The company states that the move was essential to provide the necessary area for new alkyd molding equipment and a larger research and development laboratory. Concurrent with the move, **Robert W. Grant** was named sales manager of the company. He was formerly sales manager of Marshall Engineering Co., Los Angeles, Calif.

Cheney Brothers, 350 Fifth Ave., New York 1, N. Y., has formed a new **Textiglass Sales Div.**, headed by **Emile J. Van Dyck.** Mr. Van Dyck was formerly a partner of the Textiglass Div. of Madagascar Graphite & Mica Co., 92 Liberty St., New York, N. Y.

The new division will continue to distribute the special purpose glass fabrics of **P. Genin & Cie.**, Paris, France.

Cadillac Plastic Co., Detroit 3, Mich., has established new warehouse and service facilities in St. Louis, Mo. The new operation will be known as **Plastic Supply Co.**, a division of Cadillac. This is the same name the St. Louis company used as a supplier of plastics material prior to coming under Cadillac management.

Bigelow Fiber Glass Products, Div. of Bigelow-Sanford Carpet Co., Inc., 140 Madison Ave., New York 16, N. Y., has opened sales and technical service offices at 243 W. Congress St., Detroit 26, Mich,

W. H. Coe Mfg. Co. of Canada Ltd. has opened a new sales office at 1801 Favard, Montreal, Que., which will offer a complete line of pigment colors for hot die-stamping plastics, cloth, paper, etc., as well as metallic foils and composition leaf. **W. L. Rowbotham** will head the Canadian office.

With the addition of the new affiliate, Coe now has four offices. The other three are **W. H. Coe Mfg. Co., Inc.**, 215 E. 149th St., New York, N. Y.; **W. H. Coe Mfg. Co. Inc.**, 2140 So. Oak Park Ave., Berwyn, Ill.; and **The Marking Products Corp.**, 52-54 Wellington St., West, Toronto, Ont.

Flexcraft Industries, 1943 Webster Ave., New York 57, N. Y., announces that it has taken over full production of the line of adhesives and chemicals formerly manufactured by Shuman Chemical Products, Cedar Grove, N. J. Adhesives for cementing cellulose acetate plastics, vinyl resins, rubber, wood, glass, and metal are now available from Flexcraft Industries. Production of these adhesives will be under the technical supervision of **H. L. Shuman,** former president of Shuman Chemical Products.

Fesco Fiberglass Engineering & Sales Co., Inc., 411 Bona Allen Bldg., Atlanta 3, Ga., announces the formation of a new sales office to be known as FESCO. The company represents several plastic-fibrous glass processors. The Fesco organization covers the southeastern states from Virginia to Tennessee and from Louisiana to Florida. It is equipped with warehouse facilities and a six-man sales force.

Officers of FESCO are **George R. Vance**, president, **and W. P. "Pete" Moore**, secretary-treasurer.

PERSONAL

F. C. Tucker has been appointed to the newly created position of manager of eastern sales of **General Electric Co.'s Plastics Dept.**, Pittsfield, Mass. Sales coverage will include New York, Pennsylvania, and the Atlantic seaboard.

Donald A. Comes has been elected vice president of **Farrel-Birmingham Co., Inc.**, Ansonia, Conn. He will also retain his position as general sales manager. Mr. Comes has been connected with the company since 1922 and was particularly active in developing the use of Banbury mixers.

William R. Bolton, has been named New York branch manager of **Plax Corp.**, Hartford, Conn.

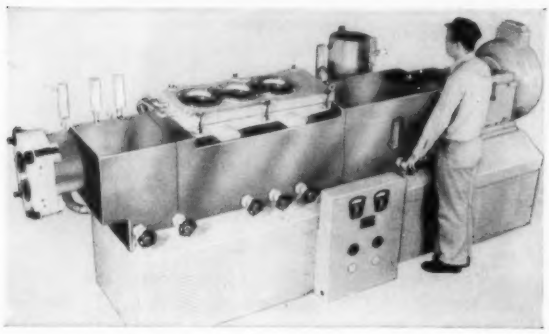
Edward K. Kalla is now sales manager of **Anesite Co.**, 3575 Touhy Ave., Chicago 45, Ill., producer of plastics pipe.

Hyman A. Weinstein has been appointed plant manager and engineer of **Keystone Plastics, Inc.**, 2331 Morris Ave., Union, N. J.

Edward F. Egan of **Frank W. Egan & Co.**, Bound Brook, N. J., recently returned from Europe after start-ink production operations and visiting Egan polyethylene coaters in plants located there.

Egan extrusion-type polyethylene coaters (patented) are produced in narrow widths for coating foil, cellophane, and glassine and in wider

Welding Engineers, Inc. Unique Dual Worm One-Operation Processing Equipment is Designed for Economy and Flexibility



A COMPLETE LINE FOR THE TREATMENT OF PLASTICS, RUBBER AND OTHER MATERIALS

Investments made in W.E.I. equipment have proved sound and have been "blue ribbon" profit-makers. They have given consistent good service in small operations producing less than 1,000,000 pounds of material a year as well as in installations with an output 20 to 30 times as large. Low maintenance costs and minimum down time have resulted in a maximum production of salable material. This, plus a minimum of scrap material, contributes to the economy of operation enjoyed by users of Welding Engineers, Inc. machines.

The flexibility of W.E.I. compounder-extruders permits application to varying products which may be devised with the rapid strides in plastics development: even installed equipment can be adapted to new processes, often without any change whatsoever, and in other cases with modification of only certain parts.

The dual worm design used in Welding Engineers, Inc. machines was developed in our own laboratories over a period of years of research* and is an inherent part of their superior capabilities.

SEVERAL BASIC STYLES are manufactured to permit the correct choice for maximum compounding, maximum extraction, and maximum output rate. Various length barrels, power capacities, speeds, heat distribution control systems, and special accessories, contribute to the success of W.E.I. machines. Paramount, however, is the dual worm design . . . with different flights in various parts of the worms . . . which permits the "custom-fitted" choice of exactly the right action on the material in each portion of the barrel—such as the feed, compounding, milling (with or without extraction) and extrusion portions.

Equipment covered under various U. S. and foreign patents issued and pending.

From the first laboratory testing to the final installation on your production line, W.E.I. compounder-extruders are actually custom-fitted to your particular processing needs. The selection of the machine elements to perform the desired process is made in our own laboratories, is subject to your approval, and is incorporated into each machine to protect your long range investment . . . to justify your choice of W.E.I. equipment.

DESCRIPTIVE DATA	Series 2000	Series 2800	Series 3500	Series 4500
*NOMINAL CAPACITY Lbs. Per Hour	100	225	400	750
DUAL WORMS	each: 2" dia.	each: 2.8" dia.	each: 3.5" dia.	each: 4.5" dia.
FEED INLET AT WORMS	3½" dia.	5" dia.	6" dia.	8" dia.
DRIVE MOTOR FOR STANDARD DUTY MACHINES	10 HP	20 HP	50 HP	100 HP
FLOOR SPACE (Exclusive of Motor)	2' x 7'	3' x 8'	3' 6" x 10'	4' x 14'
WEIGHT FOR STANDARD DUTY MACHINES	2500 lbs.	4000 lbs.	6000 lbs.	8000 lbs.

The information listed in this table is equally applicable to the Compounder-Extractor-Extruder and to the Compounder-Extruder. Each is available in all sizes.

HEAVY DUTY MACHINES FOR HIGHER HORSEPOWER ARE AVAILABLE. WRITE FOR SPECIFICATIONS.

The almost limitless number of combinations of dual worms and barrel lengths available in Welding Engineers, Inc., equipment makes it ideally suited for a wide variety of materials and processing operations. Some of the various processing problems successfully solved with Welding Engineers, Inc., equipment include:

- **COLORING POLYSTYRENE, ACRYLICS, POLYETHLENE AND MANY OTHERS**
- **COMPOUNDING CELLULOSE ACETATE MOLDING POWDER**
- **COMPOUNDING PHENOLIC MOLDING POWDER AND OTHER THERMOSETS**
- **DEWATERING SYNTHETIC RUBBER**
- **EXTRACTION OF VOLATILES FROM THERMOPLASTICS**
- **SCRAP RECLAMATION**
- **COMPOUNDING SPECIAL BLENDS**

We maintain an extensive engineering and laboratory-experimental staff to work with you in the solution of your Compounding-Extracting-Extruding Problems.

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widths with continuous operation for polyethylene coating of kraft up to production rates of 1000 ft. per minute. The company claims that approximately 75% of all the polyethylene coaters in use throughout the world use Egan equipment.

I. Wendell Hamm has been named director of manufacturing of **The Carborundum Co.**, Niagara Falls, N. Y. Mr. Hamm was formerly chief of industrial engineering of Du Pont's Nylon Div., Seaford, Del.

W. D. Morrison has been appointed assistant to the director of the Development Dept. of **Celanese Corp. of America**, 180 Madison Ave., New York 16, N. Y. Prior to his promotion, Mr. Morrison was assistant manager of the Product Development Dept. of the company's Chemical Div.

John C. Siegmann has been elected secretary and treasurer of **The Landers Corp.**, 837 Buckingham St., Toledo, Ohio. He succeeds Percy E. Roper who has retired. Mr. Siegmann has been vice president in charge of purchasing, labor relations, and scheduling. He has spent his entire business career of 28 years with Landers, starting with the company in 1926. In addition to his new responsibilities, Mr. Siegmann will also be in charge of purchasing, labor relations, and scheduling.

A. E. Moyer has been named vice president of **Snyder Chemical Corp.**, Bethel, Conn. He joined the company in 1948 and has served as sales manger for the past three years.

James A. Cruickshank has been appointed to the newly created position of assistant sales manager of **Naugatuck Chemicals, Div. of Dominion Rubber Co., Ltd.**, Montreal, Que.

George Rieger has joined **Diamond Alkali Co.**, 300 Union Commerce Bldg., Cleveland 14, Ohio. He will supervise and coordinate market research activities of the company's newly formed Commercial Development Dept. Mr. Rieger comes to Diamond from Hercules Powder Co., Wilmington, Del., where he had been assistant manager of the Sales Research Div. since Feb. 1953. For six months during that period, he was on loan to the Government, serving first as chief of the Thermoplastics Section, Chemical & Rubber Div., National Production Authority, and later becoming acting chief of its Plastics and Coatings Branch.

Arthur J. Douglas has been appointed manager of the **Research and Development Div., Winner Mfg. Co., Inc.**, Trenton 3, N. J. Mr. Douglas joined the company five years ago and has had extensive experience in design and production of fibrous glass reinforced plastics.

David W. Davenport has been named sales manager of **The S-P Mfg. Corp.**, 12415 Euclid Ave., Cleveland 6, Ohio. The company manufactures power chucks, air and hydraulic cylinders, and other equipment for the machine tool, automotive, rubber, plastics, and aircraft industries.

Mitchell A. Kapland has been appointed vice president of the **Plastics Div., The Englander Co., Inc.**, 227 N. Warwick Ave., Baltimore 23, Md.

Robert R. Moyer is now manager of technical service for thermoplastic molding materials of **Monsanto Chemical Co.'s Plastics Div.**, Springfield, Mass. He succeeds **R. D. Sackett** who has been appointed to a special study assignment concentrating on thermoplastics developmental research. After spending several years in the molding industry, Mr. Moyer joined Monsanto's Plastics Div. in 1952 as a technical service representative.

Lawrence Kaufmann, formerly of Ideal Plastics Corp., has joined the industrial sales department of **Dillon-Beck Mfg. Co.**, 1227 Central Ave., Hillside, N. J.

M. Klaidman has joined the New York City sales staff of **Auburn Button Works, Inc.**, Auburn, N. Y., where he will augment the activities of the two present representatives, **W. O. Strong** and **Sam Held.** Mr. Klaidman, who has had 20 years of experience in the field of plastics sales, was formerly associated with Seaboard Plastic Button Co. and Consolidated Molded Products Co.

MEETINGS

Oct. 7-8—Commercial Chemical Development Assn., Annual Fall Meeting, Bedford Springs Hotel, Bedford, Pa.

Oct. 7-9—International Plastics Congress, Oslo, Norway. Those desiring to attend should address the Secretariat: Forening for Norsk Plastindustri, Munkedamsveien 53B, Oslo.

Oct. 12-15—Chicago Section of the American Chemical Society, Eighth National Chemical Exposition, Chicago Coliseum, Chicago, Ill.

Oct.18—Packaging Association of Canada, Seventh Quebec Regional Conference, Sheraton-Mount Royal Hotel, Montreal, Que.

Oct. 26—Association of Consulting Chemists and Chemical Engineers, Inc., Annual Symposium and Banquet, Hotel Belmont Plaza, New York, N. Y.

Nov. 3-4—The Society of Rheology, Annual Meeting, National Bureau of Standards, Washington, D. C. Papers on mechanical behavior of monomers, elastomers, and plastics are scheduled.

Nov. 9-11—Packaging Association of Canada, Third Canadian National Packaging Exposition, CNE Automotive Bldgs., Toronto, Ontario, Canada.

Dec. 12-15—American Institute of Chemical Engineers, Statler Hotel, New York, N. Y.

Jan. 18-28, 1955—Provincial Exhibitions Ltd. and Institute of Packaging, Britain's Fourth International Packaging Exhibition, National and Empire Halls, Olympia, London, England.

May 14-22—ACHEMA XI, Chemical plant and Apparatus Exhibition and Congress, Frankfurt am Main, Germany. Sponsored by Deutsche Gesellschaft für Chemisches Apparatewesen (DECHEMA). Additional information may be obtained from the Chicago Section of the American Chemical Society, 86 E. Randolph St., Chicago 1, Ill.

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WITCIZER 100 *(Butyl Oleate—Technical)—for ethyl cellulose, cellulose nitrate, vinyl chloride, polystyrene.*
WITCIZER 101 *(Butyl Oleate—Premium)—recommended where color and odor are important.*
WITCIZER 200 *(Butyl Stearate T-1)—plasticizer-solvent in coating compositions.*
WITCIZER 201 *(Butyl Stearate C-1)—primarily used in cosmetics.*
WITCIZER 300 *(Dibutyl Phthalate)—high efficiency and compatibility for nitrocellulose lacquers.*
WITCIZER 312 *(Dioctyl Phthalate)—outstanding primary plasticizer for vinyls.*
WITCIZER 313 *(Di-Iso-Octyl Phthalate)—used interchangeably with 312 (DOP), low viscosity suggests use in plastisols and organosols.*
WITCIZER 412 *(Dioctyl Adipate)—primary plasticizer for vinyls, with excellent low temperature flexibility.*

STABILIZERS

STAYRITE #70 *—unusual heat stability, unimpaired clarity, good lubricity.*
STAYRITE #80 *—liquid, very effective under dynamic heat conditions, i.e., calendering and extrusion, valuable in plastisols and organosols.*
STAYRITE #90 *—non-toxic. Acceptable for food-wrapping film.*
STAYRITE 10 *(Lead Stearate #30)—for opaque and semi-transparent compounds. Especially good for electrical insulating materials.*
STAYRITE 15 *(Lead Stearate #50) (dibasic)—high lead content, heat stabilizer and lubricant for opaque goods.*
STAYRITE 20 *(Barium Stearate)—for high clarity, color-stable items which come in contact with sulphur fumes.*
STAYRITE 22 *(Cadmium Stearate)—light stabilizer for transparent formulations.*
STAYRITE 25 *(Calcium Stearate)—non-toxic. Acceptable for vinyl films for foodstuffs.*

WITCIZERS*— plasticizers manufactured by Witco, are produced to the most rigid specifications, thus assuring high quality and purity—and STAYRITES*, Witco-developed vinyl stabilizers, are tailored to meet your stabilization problems at all times because of their uniformity and effective protection.

And to meet customer needs, answer customer problems, *Witco's* research and technical service laboratories combine wide experience with the most modern and complete facilities. Investigate the advantages offered your products by *Witco* WITCIZERS and STAYRITES today. Samples available for your evaluation.

*Trade-mark applied for

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HYDRAULIC PRESSES: 1—Erie Belt Press, 4242 Tons, 2—8" openings, 18'-0" x 52" steel steam platens, 6 rams—30" dia. x 16" stroke. 1—Birdsboro, 2000 Tons, down-acting ram 34" dia. x 14" stroke, 48" DLO, 42" x 42" bed area. 1—HPM, 750 Tons, down-acting, ram 28" dia. x 43" stroke, 72" DLO, 59" x 44" bed area, MD Low and High Pressure Pumps and Accumulator System. 1—Clearing, 500/1500 Tons, completely self-contained with controls for manual or automatic operation, suitable for compression and injection molding. 1—Baldwin-Southwark, 400 Tons, slab-side, 30" x 30" steel steam platens, 23" DLO, ram 21" x 17" stroke. 1—Farrel, 393 Tons, 48" x 48" steam platens, 2—15" openings, 4 rams 10" dia. x 24" stroke, approx. 15" per opening. 1—Baldwin-Southwark, 200 Tons, 3-opening 20" x 20" steeel steam platens, ram 12" x 20" stroke, 3500 PSI. 1—Southwark, 200 Tons, 2-opening, 30" x 30" steel steam platens, ram 14" x 14" stroke. 1—Thropp, 150 Tons, 36" x 36" steel steam platens, 15" DLO, ram 14" x 12" stroke. 1—Watson-Stillman, 100 Tons, down-acting ram 11½" x 9½" x 6" stroke, 22" x 20" bed, 24" DLO, self-contained, 15 HP MD Vickers Pump. Unit practically new. 1—Watson-Stillman, 100 Tons, 11¾" x 12" platens, 22½" DLO, ram—8" dia. x 15" stroke, complete with 3 HP MD Pump. 1—HPM, 100 Tons, 18" x 18" platen area, ram—8" dia. x 18" stroke, 30" DLO, steel cylinder—4000 PSI. 2—Burroughs, 75 Tons, down-acting, 17½" x 17" electric-heated platens, 13½" DLO, ram—8" dia. x 10" stroke, complete with 7½ HP MD Oilgear Pump. 1—HPM, 35 Tons, down-acting ram 6" dia. x 6" stroke, 15" DLO, 12" x 6" bed area, self-contained. 1—Northern, 20 Tons, Model 20-S, 18" x 12" bed, 8" throat, 12" DLO, 12" stroke, 5 HP MD Pump, controls. 1—Indusco Laboratory Press, 12 Tons, hand operated, 8" x 8" electrically heated platens. New. INJECTION MOLDING MACHINES: 1—Plasticor Vertical 2 oz., electric heated, hand operated. 1—HPM Horizontal Model 54, 2 oz., 22 Ton clamp, 12 Ton injection, manual control, oil heated. 2—HPM Model 200-H, 9 oz., 200 Ton clamp, 31 Ton injection, electrically heated, full controls, excellent condition, in operation. 2—Impco Model VF-822A, 22 oz., 350 Ton clamp, 100 Ton injection, electrically heated, full controls, excellent condition. In operation. ALSO: Plastics and Rubber Extruders, Mills, Mixers, Grinders, Injection Molding Machine, Pumps, Valves, Platens, etc. JOHNSON MACHINERY COMPANY, 683-P Frelinghuysen Avenue, Newark 5, New Jersey, Tel.: BIgelow 8-2500. What have you for sale? What are you looking for?

FOR SALE: Pelletizer, Taylor Stiles, "Little Giant" with 2 H.P. motor and varidrive—complete. Pelletizer with H.P. and a variable speed drive. Extruder, 6" Allen Strainer ideal for vinyl plastic straining. FRANKLIN JEFFREY CORP., 2004 MacDonald Avenue, Bklyn., N.Y. Tel.: ES 5-7943.

SAVE WITH GUARANTEED REBUILT EQUIPMENT: Hydraulic Presses: 2 new R.D. Wood 500 ton 54"x26" platen, 42"x37", 20" ram, 475 tons; 2-7 opening 27"x27", 18" ram, 565 tons; 24"x24" 12" ram, 170 tons; 24"x20" 10" ram, 118 tons; 20"x20" 10" ram, 118 tons; 20"x20" 10" ram, 200 tons; 30"x20" 8" ram, 75 tons; 24"x20" 8" ram, 75 tons; 14"x14" 8" ram, 75 tons; 15"x15" 8" ram, 75 tons; 2-19"x24" 10" rams, 78 tons; 12"x12" 6½" ram, 50 tons; 14"x14" 8" ram, 50 tons; 8"x 9½" 4½" ram, 20 tons; 16"x16" 3½" rams, 12 tons; PREFORM PRESS: Colton 5½ T, Reeves Drive and Motor, late type Stokes Model T; LABORATORY PRESSES: Carver & Watson Stillman Units; NEW UNIVERSAL DUAL PUMPING UNITS: 3-15 HP: NEW LABORATORY MILLS, and CALENDERS; EXTRUDER: Modern Plastic late type 3½"; ACCUMULATOR; HPM 6" ram 2500#, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO. INC., 285 Hudson Street, New York 13, N. Y.

LEOMINSTER 8 oz. Injection Molding Machine complete late type. Plastic and Rubber Equipment. Farrel 16" x 48", 15" x 36" and 6"x12", 2 roll mills. Mills and Calenders up to 84". New Seco 6"x12" and 6"x16" Lab. Mixing Mills and Calenders. Rubber & Plastic Extruders. Stokes #280, 4" dia. Preform Machine. HPM 200 ton 30" x 48" Platens. 350 ton 22"x24". New Loomis 340 ton, 24"x56" platens. Southwark 350 ton, 42"x24" platens. 200 ton Brunswick 21"x21" Platens, 14" Ram. 100 ton 24"x24". Elmes 75 ton 30"x36". Also Lab. to 2000 tons from 12"x12" to 48"x48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump 250# W.S. 4 Plgr. High and Low Pressure Hydr. Pump. Elmes Hor. 4 Plgr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & Single Punch Preform Tablet Machine ½" to 4". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers. Plastic Grinders. Heavy duty mixers, gas boilers. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107-8th Street, Brooklyn 15, N.Y. STerling 8-1944.

AVAILABLE AT BARGAIN PRICES

Colton 2RP and 3RP 10-35 Rotary & #5½ Tablet Machines. Rotex, Tyler Tum-mer, Selectro, Robinson, Raymond, Gayco, Great Western Sifters. Mikro Bantam, 1SH, 2TH, 3W, 4TH Pulverizers; Schutz O'Neill Mills. Baker Perkins Heavy Duty Steam Jacketed, Double Arm, from 12 to 200 gal., Mixers (Unidor and Vacuum also). J. H. Day, from ¾ up to 100 gal., Imperial and Cincinnatus D. A. Jacketed, Sigma Blade Mixers. Day, Robinson, Munson Dry Powder Mixers, 15 to 10,000 lbs., all sizes. F. J. Stokes RBB Rotary and R Tablet Machines. Package Machy. FA, FA4, Miller, Hayssen, Scandia, Oliver Auto. Wrappers. REBUILT AND GUARANTEED—This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements. UNION STANDARD EQUIPMENT CO. 318-322 Lafayette St., New York 12, N. Y.

FOR SALE: 1—F.B. 32"x92" inverted-L 4 Roll Calender, reduction drive, d.c. vari-speed motor; 1—Adamson 5'x28' Vulcanizer, quick-opening door, A.S.M.E.; 1—5'x12' quick-opening door, 125 psi. 1—Royle #4 Extruder, motor driven. 1—6"x12" Laboratory Mill, m.d. 1—Ball & Jewell #2 Rotary Cutter, 15 h.p. motor. 3—#28 Devine Vac. Shelf Dryers, 19—59"x78" shelves, complete. 1—Farrel-Birmingham 16"x13" 3 Roll Calender. 4—Hymac 150 ton 18"x18" Hydraulic presses, electrically heated platens, 9" dia. rams. 1—Farrel 20"x22"x60" mill, top cap frame, falk reduction drive, 100 h.p. motor. 2—Farrel 16"x42" Mills with reduction drive and 100 h.p. motor. Also other sizes: Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. Send us your inquiries. What have you for sale? CONSOLIDATED PRODUCTS CO., INC., 50 Bloomfield Street, Hoboken, N. J. HOboken 3-4425. N. Y. Tel.: BArclay 7-0600.

FOR SALE: Fabricating assembly fixture, hexagon shape 78" across hexagon, 71" high, 6 stations with air cylinders, 31" from floor to working table. Table rotates 360°. Reply Box 2246, Modern Plastics.

KUX MODEL 25 AND STOKES DD-2 and RD-3 Rotary Presses; B & J Rotary Cutters #1½ and Standard Ideal; Mikro Pulverizers Bantam, #2-SI, #2-TH; B.P. 50 HP 50 gal. Sigma Blade Jacketed Mixer; W & P 100 gal. Mixer and 10 gal. Stainless Steel Mixers. Large stock steel and stainless steel tanks and kettles. PERRY EQUIPMENT CORP., 1429 N. 6th Street, Philadelphia 22, Pa.

FOR SALE: MIXER, Day 12 gal. working capacity, double arm Sigma Blade, complete with 3 H.P. motor, also 2 SCREW MACHINES: Brown & Sharpe 1-OG Hi speed automatic, 1-0 Hand, both like new, including various accessories, also TURRET LATHE rebuilt Gisholt with various accessories. For further particulars reply AMERICAN INSULATOR CORP., New Freedom, Pa.

FOR SALE

Three 4-oz. Lester Injection Molding Machines including one Model L-½-4 with attachments for running Nylon. Can be seen in operation.

STERLING PLASTICS CO.
1140 Commerce Ave., Union, New Jersey

FOR SALE: Two 16 oz. H.P.M. injection presses, new in January, 1952. Have to sell as a result of a major shift in planning. Presses have been maintained by a top grade maintenance department and are in A-1 mechanical condition. No abuse! Will guarantee! Presses skidded and ready for immediate delivery. Reply Box 2234, Modern Plastics.

FOR SALE: Hobbing Press 800 Ton W.S. (2) 300 Ton W.S. Presses 20x20 & 29x24 Platens. 140 Ton W.S. 22x16 Platen. 85 Ton Waterbury Farrel 20x24 Platen. 63 Ton Press 15x15 Platen with Pullback Cyls. 9, 8, 4, Oz. Injection Molding Machines. 15 Ton Lab. Presses 10x8 Platen. 10 Ton Lab. Presses 6x6 Platen. Ball & Jewell Plastic Grinders. Standard Mystic Embossing Presses, Accumulators, Pumps, Valves. Many other Presses—Send For Bulletin. AARON MACHINERY CO., INC., 45 Crosby St., New York 12, N. Y. Tel. WOrth 4-8233.

FOR SALE: One R. H. Windsor Extruder RC 200 Triple Screw Compounder Extrusion Machine, Serial No. 173364. We have the original blueprint, instruction book, etc. Also One Conveyor and One Grinder. Please reply box 2239, Modern Plastics.

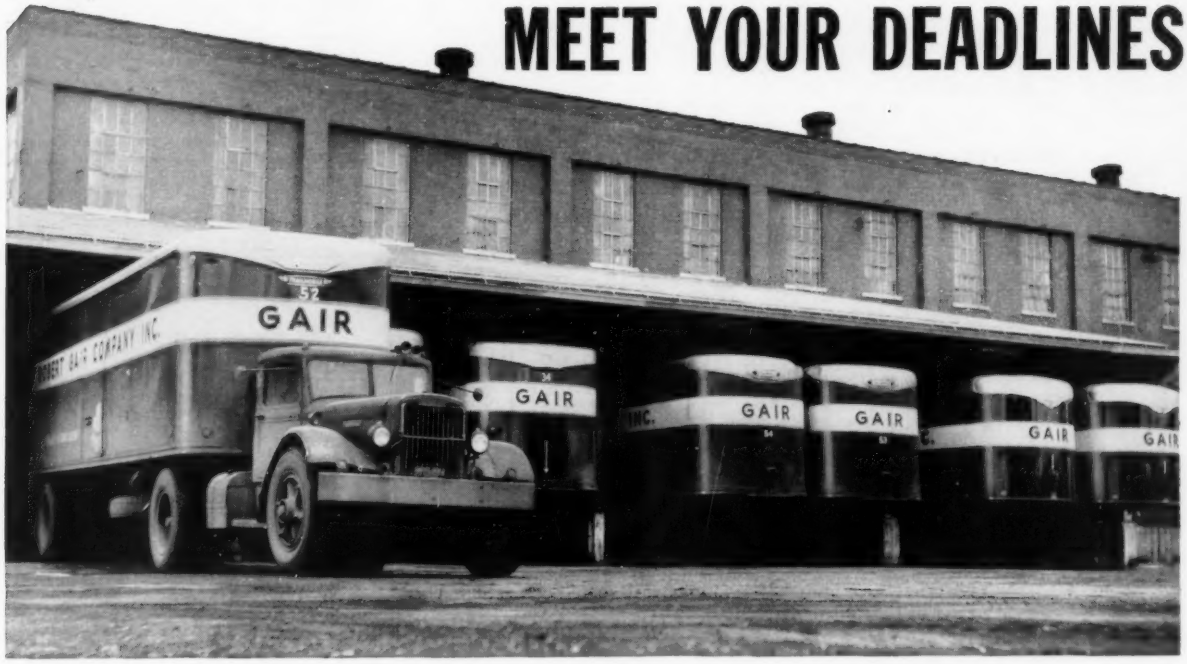
FOR SALE: 1 Royle 3¼" extruder oil-heated; 1 Watson-Stillman 200 ton molding press; 3—Colton 5½ T tablet presses; 2 Stokes 294 presses; 1 Ball & Jewell #1 rotary cutter. Also mixers, mills, presses, etc. CHEMICAL & PROCESS MACHINERY CORP., 146 Grand St., New York 13, N.Y. Tel.: WOrth 6-3430.

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(5) NEW WATSON-STILLMAN EJECTION Molding Heating Chambers, one four ounce, one six ounce, two eight ounce, one sixteen ounce. Price one third the cost of new. New 75 ton presses, size 22x22, 10" ram, 10" stroke, $1100 each, ten day delivery f.o.b. Brooklyn, New York, one or more can be obtained. HYDRAULIC SAL-PRESS CO., INC., 388 Warren Street, Bklyn., N.Y.

FOR SALE: Stainless Steel Rotary Dryer, Link Belt Co., 5'2"x16', No. 502-16, with all auxiliary equipment. Roto Louvre type. Reply Box 2237, Modern Plastics.

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CLASSIFIED ADVERTISING

(*Continued from page 268*)

FOR SALE: Injection Presses: 4, 8, 16 & 22 oz. Reed. 12 oz. Lester. 9, 16 oz. HPM, 16 oz. Watson. 1 oz. VanDorn. Scrapgrinders. Ovens. Compression & Transfer presses: 50, 100, 250, 500 tons. — Preform presses. 42" Slitting & Rewind machine. 3 HP Gasboilers. McBeth Daylite Testbooth. Equipment to be inspected in operation. List your surplus equipment with me. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13 Ill.

FOR SALE—One (1) Utility Conveyer canvas belt, width 24", length 16' 6", 32" high from floor to top of conveyer, ¾ horse adjustable motor and gear reducer. Conveyer mounted on four casters for easy moving. Reply Box 2244, Modern Plastics.

FOUR HY-MAC hydraulic press machines with the following specifications. Platen 23 x 17¼; die space, one 20⅛ x 14 5/16, three 19 x 13¼, stroke, one 18, two 9, one 4; Daylite open, one 29¾, two 18, one 21; Daylite closed, one 11¾, two 9, one 17; Tonnage, one 25, two 75, one 100. 4 Machines Complete—$6,500. NATIONAL PRODUCTS CO. 6100 Wilson Ave., K. C., Mo. Tel.: BE. 7811.

FOR SALE: 60 oz. H.P.M. 48 oz. Lester, $45,000. 48 oz. DeMattia, new. 22 oz. Impco vertical, $10,500. 20 oz. Lester, new 1950, $16,000. 16 oz. H.P.M., $11,000. 16 oz. Reed-Prentice, 1950. 12 oz. Crown Moldmaster, $10,500. 12 oz. Watson-Stillman, excellent. 12 oz. Lester w/16 oz. cylinder. 8 oz. Reed-Prentice, 1948, $8,000. 8 oz. Reed-Prentice, double link, $6,500. 8 oz. Lester, 1949, $8,000. 8 oz. Leominster, $5,000. 4 oz. Impco, $8,000. 4 oz. Lester, $3,500. 4 oz. Lester, vertical. 4 oz. Acme, new. 2 oz. Watson-Stillman, vertical, almost new. 300 ton French Oil Mill. #235-A Stokes. Small plant, New York area, w/3 machines, etc. $13,000. Terms to right party. ACME MACHINERY & MFG. CO., 102 Grove St., Worcester, Mass.

HYDRAULIC PRESSES rebuilt, repaired. Used presses from laboratory to 1000 tons standard and special, molding and hobbing presses, etc. Used pumping units up to 10,000 p.s.i. all capacities. CLIFTON HYDRAULIC PRESS CO., 291 Alwood Rd. P.O. Box 325, Clifton, New Jersey.

AUTOMATIC PAINT SPRAY MACHINES "Sepanski" Excellent Condition less than 1 year old. 5 are 12 inch—1 is 18 inch size. Less than half original cost. TIP-TOP PRODUCTS COMPANY, Omaha, Nebraska.

FOR SALE: One (1) pipe pulling conveyer 16' long 32½" high from floor to top of conveyer. Conveyer 12" wide complete with clutch less motor. Reply Box 2245, Modern Plastics.

FOR SALE: One 350 Ton IMPCO Transfer Press. Excellent condition. May be seen running in our plant. Reply Box 2216, Modern Plastics.

MACHINERY and EQUIPMENT WANTED

WANTED: Plant or Machinery including Rubber Mills, Hydraulic presses, Sturdy mixers, Calenders, Banbury mixers, Pulverizers, Grinders, Rotary cutters, Extruders, Screens, Injection Molding machines, Dryers. CONSOLIDATED PRODUCTS CO. INC., 50 Bloomfield Street, Hoboken, N.J. HOboken 3-4425. N.Y. Tel.: BArclay 7-0600.

WANTED: Van Dorn molding machines, 1 or 2 ounce lever controlled. Good condition desirable, but not essential. Please state best cash price, location, specifications, serial number, and condition in first letter. DEPARTMENT M, 111 S. Floyd St., Louisville, Kentucky.

WANT TO PURCHASE EQUIPMENT as follows: #9 Banbury, #3A Banbury, 1 60" Mill, 2 84" Mills, 2 Large Size Strainers. All fully equipped with motors and electronics, reply in full detail. Reply Box 2228, Modern Plastics.

WE DESIRE TO PURCHASE ¾ ounce Moslo Hydraulic Minijector injection presses—late models. ROBERT BRADLEY COMPANY, 26 Bedford Street, Waltham 54, Mass.

WANTED: Plastic and Rubber Machinery Calenders, Banbury Mixer, Rubber Mills, Mixers, Hydraulic Presses, Grinders, Pulverizers, Rotary Cutter, Extruders, Embossing Machines, Slitters, Tubers, Etc. List your surplus machinery with us for quick sales. Also Plastic and Rubber Machinery sold of every description. T & M MACHINE & TOOL CO., 15-17 Greenpoint Ave., Brooklyn 22, N.Y. Tel.: EV 9-1964.

WANTED: Six (6) machines for four (4) ounce capacity—preferably H.P.M. or Reed's. MOONGLOW NOVELTY CORPORATION, 959 Whittier St., Bx. 59, N.Y. Kilpatrick 2-6100.

WANTED: 8 oz. Injection Molding Machine, No. 3 Banbury Mixer, Calender, Extruder. Give particulars. Reply Box 2238, Modern Plastics.

WANTED TO BUY: Lab Mixer, Heavy duty, Sigma blades. Lab Extruder, Hydraulic ram type. State condition and price in reply to Box 2242, Modern Plastics.

MATERIALS FOR SALE

FOR SALE: Reground High Impact Polystyrene scrap; 30,000 pounds Mahogany mottle reprocessed Acetate pellets originally made for toy gunstocks. Priced very low. Flesh pink Butyrate pellets, also other colors and Black. Various colors reprocessed High Impact Polystyrene pellets, also bright colors Acetate, all at low prices. Samples on request.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.
Telephone: MAin 5-7450

FOR SALE: 10,000 lbs surplus Celluloid Sheet Stock Assorted Colors. Gauges: .125 to .200 size 20 x 50. Price extremely low. Reply Box 2213, Modern Plastics.

PLASTISOL SCRAP—Flesh color—50,000 lbs. AMERICAN VINYL CORP., 73-30 Grand Ave., Maspeth, N. Y.

FOR SALE: 20,000 lbs. each Red and Blue Styrene Pellets—28 cents. Surplus lot Red Acetate Pellets—15,000 lbs.—25 cents. We are also in the market for all surplus plastic scrap and powder. FRANKLIN JEFFREY CORPORATION, 2004 MacDonald Avenue, Bklyn., N. Y. Tel.: ES 5-7943.

MATERIALS WANTED

WANTED
Plastics Scrap and rejects of all kinds, ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.
Telephone MAin 5-7450

FRENCH PLASTICS MANUFACTURER seeks exclusively for France Colored Vinyl or Styrene Sheets. Important outlet granted. Reply Box 2229, Modern Plastics.

WANTED: Plexiglas and Lucite scrap, salvage and cut-offs, any quantity. DUKE PLASTICS CORP., 406 Atlantic Ave., Bklyn. 17, N. Y. Ulster 8-9413.

FRENCH PLASTICS MANUFACTURER seeks, on royalty payment arrangement, license for new plastics. In particular plastics used in the freezing industry. Reply Box 2230, Modern Plastics.

MOLDS FOR SALE

MOLDS FOR SALE: (2) Two Ladies Hair Brush Molds: (1) One 4 Cavity—Shot Weight 6 oz.; (1) One 3 Cavity—Shot Weight 9 oz.—one-half Round Style. To be sold for Export Use Only. Please Reply Box 2226, Modern Plastics.

MOLDS WANTED

WEST COAST INJECTION MOLDER interested in leasing houseware and toy molds for distribution in the eleven western states only. Obsolete and current items acceptable. Freight on molds paid both ways also leasing fee in advance if required. Will need molds for approximately six weeks only. Molds insured when leaving your plant until return.
Reply Box 2209, Modern Plastics.

PLANTS FOR SALE

FOR SALE
Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars, reply Box 2202, Modern Plastics.

HELP WANTED

PLASTICS SALES TRAINEES
Major raw materials supplier in plastics field has interesting sales training opportunities for college graduates, to age 27, with degree in chemical engineering or chemistry preferred. These positions offer excellent opportunities to young men interested in sales careers.
Formal training program of 6 months in NYC area with eventual assignment to a sales territory elsewhere in the U.S.
Please send complete resume including age, education, experience and present salary information.
Box MP 1064, 221 W. 41 St., N.Y. 36, N.Y.

VINYL COATINGS AND HOT MELT CHEMISTS. Chemists with three or more years' experience in formulating vinyl surface coatings (solutions, plastisols, organosols) and/or wax and resin hot melts to direct laboratory projects on customer service work. Include resume with letter. AMERICAN RESINOUS CHEMICALS CORP., 103 Foster Street, Peabody, Mass.

SMALL MECHANICAL GOODS PLANT located in New York State has excellent permanent position, with opportunities for advancement for man 30-40 years of age, with technical and practical experience in rubber compounding and product development. Reply giving full particulars of experience and training, salary expected, education, etc. Reply Box 2235, Modern Plastics.

FABRIC COATINGS CHEMIST. Development and Production vinyl organosols, laticies, rubber coatings. Excellent opportunity for personal advancement. Send complete resume, salary expected and recent photograph to: CRAWFORD MANUFACTURING CO., INC., 3rd & Decatur Streets, Richmond, Va.

PLASTICS EXECUTIVES—$5,000 to $25,000. We have immediate openings with leading national concerns for competent men in all phases of the Plastics industry. Rapid, confidential, nationwide service. For application, send your name and address to: E. B. Shea, Plastics Industry Division, DRAKE ENGINEERING PERSONNEL, 7 West Madison Street, Chicago 2, Illinois.

PLASTIC CHIEF ENGINEER. Midwest injection molding plant doing Three Million Dollars requires experienced man responsible for estimating mold costs and mold design, production fixtures, customer product development and supervise all engineering functions. Salary commensurate with ability and experience. Unusual opportunity, work with management group. Confidential. Reply Box 2201, Modern Plastics.

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where a single stabilized temperature is adequate for some small molds or molds with shallow cavities, it increases production and reduces rejects.

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The mobile temperature control unit functioning in leading plastics plants from coast to coast. Ready to operate when connected to electricity, water, and drain.

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A compact unit designed for permanent installations. (Can be equipped with casters.) Requires approximately 50% less floor space than Model 6002 with same capacities.



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CLASSIFIED ADVERTISEMENTS

(Continued from page 270)

VINYL CHEMIST
Experienced on heavy or light gauge calendering. All replies handled in strictest confidence.
Reply Box 2210, Modern Plastics.

CHEMICAL ENGINEER—5 to 10 years' experience in thermoplastics processing, primarily film extrusion. Process development work with manufacturer of film and molding powder. Eastern state location. Reply Box 2214, Modern Plastics.

EXTRUSION—Experienced extrusion engineer or dye design man for established custom extrusion house. Should be capable of handling special set-ups, various shapes, compounds, and independent action. Location metropolitan New York. Send full information in first letter. Reply Box 2204, Modern Plastics.

TECHNICAL SERVICE MANAGER. Thoroughly experienced in injection and compression molding. Must have chemical and mechanical background, and proven ability to supervise personnel. Excellent opportunity for an aggressive and energetic man interested in an executive position with a large molding company. State experience, references, and salary desired. All correspondence will be kept confidential. Reply Box 2233, Modern Plastics.

TECHNICAL SERVICE REPRESENTATIVE
PLASTICS INDUSTRY
Major supplier of thermoplastic sheets, films and molding compounds, requires a field technical service man, to age 35. Prefer graduate in engineering or physical sciences, but must have at least 2 years' technical training at college level. Experience in plastics industry necessary with emphasis in the field of thermoplastics, specifically: packaging films, injection molding, and sheet fabrication.
Submit complete resume stating age, education, experience and salary requirements. Box MP1055, 221 W. 41 St., N.Y.C. 36, N.Y.

PLASTIC PRODUCT AND TOOL DESIGN ENGINEER wanted by a young growing Pennsylvania concern in custom and proprietary molding of industrial parts. Experience in compression and transfer molding desirable. Please state experience, age, and family status, plus salary desired. Reply Box 2211, Modern Plastics.

PLASTIC CHEMIST thoroughly familiar with Formulating and Processing Phenolic Molding Compounds. Midwest manufacturer. Reply giving salary desired and experience. All replies confidential. Reply Box 2222, Modern Plastics.

PASTE RESIN CHEMIST. Leading plastics supplier requires a chemist or chemical engineer with a proven record of productivity in paste resin field. This is a stimulating opportunity offering recognition in proportion to your contribution to developing new applications of paste resins. You can be sure of careful, confidential, and immediate consideration if you will kindly send us a complete resume of your scholastic and work achievements, salary requirements, and reasons for wishing to make a change. Tell us too something about your career aspirations. Reply Box 2218, Modern Plastics.

SUPERVISORS AND OPERATORS for modern plastic polyethylene film extrusion plant. Excellent opportunity, steady employment in Southwest. Reply Box 2243, Modern Plastics.

OUTSTANDING OPPORTUNITY FOR CHEMIST with 8-10 years technical experience in phenolic resins and molding compounds. To take charge of research, development, quality, formulations and staff. Excellent position for the right man. Replies held confidential.
Reply Box 2231, Modern Plastics.

WANTED. The best polyethylene flat sheet (thin film) extrusion engineer in the U. S. We offer the best pay and complete responsibility. This is a new program requiring design of equipment, installation, and finally production. East Coast. Send complete resume. Our people know of this advertisement. Replies will be held in strictest confidence. Reply Box 2215, Modern Plastics.

SHIFT FOREMAN (PLASTIC ENGINEER preferred if qualified) for Modern Injection Molding Plant with 7 Reed-Prentice machines. Must be thoroughly experienced and capable of full responsibility for production, quality, maintenance and supervision of personnel. Prefer man with engineering approach to molding problems and capable of instructing operators to follow molding and inspection standards set-up and spot checked by him. We want the best man in the industry and will reward with top pay, bonus, pleasant working conditions and advancement to superintendent. Give complete resume, including references. All replies held strictly confidential. Don't Overlook This Opportunity If You Can Qualify For This Position. PLASTIC MOLDED PRODUCTS CO., 6044 N. Pulaski Rd., Chicago 30, Ill.

COLOR CHEMIST: Leading Plastics raw material supplier has a career opening for a color chemist. Job involves color research on following type problems: measurement and specification of colors and other optical properties, color incorporation, selection and development of appropriate instruments and interpretation of optical measurements. Qualifications: B.S., M.S., or Ph.D. in physics or physical chemistry. Good organic chemistry and chemical engineering training desirable. Experience in polymer or colorant manufacturing useful but not necessary. You can be sure of careful, confidential, and immediate consideration if you will kindly send us a complete resume of your scholastic and work achievements and salary requirements. Tell us, too, something of your career ambitions. Reply Box 2219, Modern Plastics.

PLASTICS ENGINEER
Major supplier of thermoplastic molding compounds has a challenging and permanent opportunity for a plastics engineer, to age 35, with previous experience in molding compound formulation and fabrication, preferably in cellulose acetate formulations. Applicants should have a degree in engineering or physical sciences. Position is located in New York City area. Reply stating age, education, experience and salary requirements.
BOX MP 1040, 221 W St., N.Y. 36

INJECTION MOLDING FOREMAN. Large molding company requires experienced man for growing department. Should be experienced in the molding of large sections from Polystyrene, and plastic steering wheels from Tenite II material. Must be able to make adjustments of machine cycles, work out molding problems, train operators, and maintain production schedules. Give full details such as experience, education, and salary expected in first letter. Replies will be held in confidence. Reply Box 2208, Modern Plastics.

PLASTICS DEVELOPMENT CHEMIST-ENGINEER
National Rubber Company needs a man with experience in Formulation and Industrial use of Vinyl Plastisols and Organosols for development department of New England Chemical Plant. This is a permanent position with a rapidly expanding division of the company.
Send complete resume of qualifications. Indicate salary requirements and detail experience background.
Reply Box 2221, Modern Plastics.

WANTED—Experienced salesman now calling on users of injection molded plastics products. We can run customer owned molds or will build new molds for volume items. Reply Box 2217, Modern Plastics.

PLASTIC ENGINEER. Large molding company requires an experienced man for expanding injection molding department. Should be thoroughly experienced in molding and finishing plastic steering wheels. Must be capable of training personnel, supervising the setting up of any molds, set molding standards, and work out new finishing techniques. Excellent future for qualified person. Your inquiry will receive immediate attention and will be held strictly confidential. Send full details, work history, and salary required to Box 2207, Modern Plastics.

ENGINEER for reinforced plastic experimental and production work. Must have thorough knowledge of polyester-fiberglas laminating techniques. Bag and matched tooling experience particularly desirable. Excellent opportunity in an established firm in a southwestern state. Submit resume of experience and salary requirements. Reply Box 2203, Modern Plastics.

SALES ENGINEER to represent old-established injection molder. Press capacity 4 to 200 ounces. Tool room, painting, silk screening, hot stamping—all conveyorized. Straightline assembly. Automatic packaging equipment. Prefer experienced men and men with industrial contacts. Also men controlling one or more special deals. Large midwest plant. Give complete details. Personal interview to follow. Reply Box 2200, Modern Plastics.

CHEMICAL ENGINEER. Engineer with several years experience in the field of glass reinforced moldings and laminates. Must be thoroughly familiar with all types of resins and filler systems. Will be engaged in consulting, development of new materials and fabricating techniques, and will be required to coordinate the work of several technicians. Salary open. Experience with the requirements of the electrical industry helpful. Send resume or write for application to: WESTINGHOUSE ELECTRIC CORPORATION, Educational Dept., East Pittsburgh, Pa.

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INDEX OF ADVERTISERS

OCTOBER 1954

Acheson Dispersed Pigments Co. 221
Acromark Company, The 182
Adamson United Company 197
Aetna-Standard Engineering Co., The 157
Allen, Alva F. 193
Allied Chemical & Dye Corp.
National Aniline Division 27
Plaskon, Barrett Division 152, 153
American Agile Corporation ... 234
American Cyanamid Company
Pigments Division 165
Plastics & Resins Division ... 155
American Pulverizer Company .. 247
American Steel Foundries, Elmes Engineering Division 68
Anorgana G.M.B.H. 255
Apex Machine Company 238
Auburn Button Works, Inc. 222
Avery Adhesive Label Corp. 190

B.I.P. Engineering Ltd. 70
Bakelite Company, A Division of Union Carbide and Carbon Corporation 129, 177, 178
Baldwin-Lima-Hamilton Corp. .. 189
Ball & Jewell, Inc. 6
Bamberger, A., Corporation 251
Barber-Colman Company 182
Wheelco Instruments Division 60
Battenfeld, Gebr. 54
Berkshire Chemicals Inc., Innis, Speiden & Co., Inc. Division .. 244
Bethlehem Steel Company 83
Bigelow-Sanford Carpet Co., Inc.
Bigelow Fiber Glass Products Division 259
The LaConte Reinforced Plastics Division 167
Boonton Molding Co. 36
Borden Company, The, Chemical Division 46
Borg-Warner, Marbon Corp. Subsidiary 86
Buttondex Corp. 168

Cabot, Godfrey L., Inc. 147
Cadillac Plastic Company 7
Cambridge Instrument Co., Inc. 203
Carbide and Carbon Chemicals Company, A Division of Union Carbide and Carbon Corporation 130
Carver, Fred S., Inc. 167
Catalin Corporation of America . 1
Celanese Corporation of America
Chemical Division 171
Plastics Division 9
Chemical Products Corporation .. 242
Chemold Company 185
Chemore Corporation 45
Chicago Molded Products Corp. . 4
Cincinnati Milling Machine Co., The 80
Claremont Waste Manufacturing Co. 208
Classified 268, 270, 272, 273
Coast Manufacturing & Supply Co. 20
Coe, W. H., Mfg. Co., Inc. 238
Commercial Plastics and Supply Corporation 183
Commonwealth Plastics Corp. .. 29
Connecticut Plastic Products Co., Inc. 180
Continental Can Company, Mills Plastic Division 159
Crompton-Richmond Co., Inc. .. 263
Crucible Steel Company of America 241
Cumberland Engineering Company Inc. 16
Curbell, Inc. 192

Dake Engine Company 64
Daniels, T. H. & J., Ltd. 236
Davis, Joseph, Plastics Co. 172
Davis-Standard Sales Corporation 51
Deakin, J. Arthur, & Son 235
Deecy Products Co. 192
DeMattia Machine and Tool Co. 257
Detroit Macoid Corporation 218
Diamond Alkali Company .. 30, 278
Dowding & Doll Ltd. 215
Dunning & Boschert Press Co., Inc. 194
duPont de Nemours & Co. (Inc.) Chemical Sales, Explosives Department 55
Film Department 33
Polychemicals Department 10, 11
Durez Plastics & Chemicals, Inc. Inside Front Cover

Eastman Chemical Products, Inc. 149
Eastman Machine Co. 242
Egan, Frank W., & Company .. 62
Electric Auto-Lite Company, The, Instrument and Gauge Division 273
Electro Dynamic, Division of General Dynamics Corporation ... 209
Electromold Corp. 235
Elgin National Watch Company 188
Elmes Engineering Division, American Steel Foundries ... 68
Emery Industries, Inc. 90
Enjay Company, Inc. 151
Erie Engine & Mfg. Co. 228
Erie Resistor Corporation 87
Erinoid Limited 19
Ever Ready Label Corp. 195

Fabricon Products, Inc., Plastics Division 206
Farrel-Birmingham Co., Inc. ... 85
Ferro Corporation, Color Division 255
Firestone Plastics Company, Chemical Sales Division 162, 163
Flexible Products Co. 227
Food Machinery and Chemical Corporation, Ohio-Apex Division 275
Foster Grant Co., Inc. 50

Gair, Robert, Company, Inc. ... 269
General American Transportation Corporation, Plastics Division 65
General Aniline & Film Corporation, Commercial Development Department 81
General Dynamics Corporation, Electro Dynamic Division 209
General Electric Company Back Cover
Gering Products, Inc. 61
Girdler Company, The 219
Glass Fibers Inc. 238
Glass Yarns & Deeside Fabrics Ltd. 40
Glidden Company, The 201
Goodrich, B. F., Chemical Company 3, 52
Goodyear Tire & Rubber Company, The 14, 15
Gries Reproducer Corp. 276

H & R Industries 240
Hale and Kullgren Incorporated 157
Hardesty, W. C., Co., Inc. 210
Harrington & King Perforating Co., The 263
Hercules Powder Company 69
Hinde & Dauch 213
Hydraulic Press Mfg. Co., The .. 21

Ideal Plastics Corporation 25
Imperial Chemical Industries Limited 43
Improved Machinery Inc. 168
Industrial Heater Co., Inc. 259
Industrial Research Laboratories 196
Innis, Speiden & Co., Inc., Division of Berkshire Chemicals, Inc. . 244
Interchemical Corporation, Finishes Division 84

Jamison Plastic Corp. 242

Kellogg, M. W., Co., The .. 245, 246
Kentucky Color and Chemical Company, Inc. 226
Kingsley Stamping Machine Co. 259
Kohnstamm, H., & Co., Inc. 271
Koppers Company, Inc. 59, 79
Kurz-Kasch, Inc. 17

Lane, J. H., & Co., Inc. 195
Latrobe Steel Company 63
Lehmann, J. M., Company, Inc., Wm. R. Thropp & Sons Div. 42
Lembo Machine Works, Inc. ... 198
Lester-Phoenix, Inc. 58
Lewis Welding & Engineering Corporation, The 24
Libbey-Owens-Ford Glass Company, Fiber-Glass Division ... 202
Liberty Machine Co., Inc. 244
Logan Engineering Co. 38
Lucidol Division, Wallace & Tiernan Incorporated 194

Machine Factory and Foundry Ltd. 208
Manufacturers' Literature . 211, 212
Marblette Corporation, The ... 140
Marbon Corp., Subsidiary of Borg-Warner 86
Markem Machine Company 232
Mayflower Electronic Devices Inc. 180
Metallizing Engineering Co., Inc. 35
Metaplast Process, Inc. 263
Metasap Chemical Company 44
Michigan Chrome & Chemical Co. 222
Michigan Molded Plastics, Inc. .. 196
Midland Die & Engraving Co. .. 124
Miller, Frank, & Sons 233
Mills Plastic Division, Continental Can Company 159
Minneapolis-Honeywell Regulator Co., Industrial Division 22
Mitts & Merrill 203
Modern Plastic Machinery Corp. 13
Molded Fiberglass Company ... 275
Molded Products 230, 231
Monsanto Chemical Company
Organic Chemicals Division .. 37
Plastics Division 199, 253
Morningstar Corporation, The .. 237
Mosinee Paper Mills Company .. 135
Moslo Machinery Company 56
Mt. Vernon-Woodberry Mills ... 204
Muehlstein, H., & Co., Inc. 261

Nash, J. M., Company 220
National Aniline Division, Allied Chemical & Dye Corporation 27
National Lead Company 72
National Rubber Machinery Co. .. 73
Naugatuck Chemical 145, 187
Newark Die Company 26
New England Lacquer Co. 207
New Hermes Engraving Machine Corp. 167
Northern Industrial Chemical Co. 172

Ohio-Apex Division, Food Machinery and Chemical Corp. .. 275
Owens-Corning Fiberglas Corp. . 229
Owens-Illinois 12

Paper Machinery & Research, Inc. 180
Pasadena Hydraulics, Inc. 198

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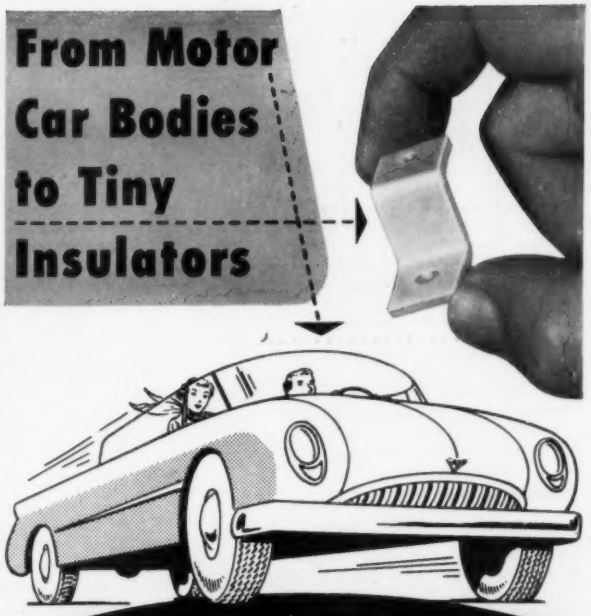
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CUSTOM MOLDERS OF REINFORCED PLASTICS

Ashtabula, Ohio

Peerless Roll Leaf Company, Inc. 228
Peter Partition Corp. 166
Pioneer Scientific Corp. 166
Pittsburgh Coke & Chemical Co. Inside Back Cover
Pittsburgh Plate Glass Company, Fiber Glass Division 89
Plaskolite Incorporated 182
Plaskon, Barrett Division, Allied Chemical & Dye Corporation 152, 153
Plastic Molders Supply Co., Inc. 193
Plastics Engineering Company .. 23
Plastiplate Co. Inc. 243
Pluess-Staufer 168
Porter, H. K., Company, Inc., The Watson-Stillman Company Division 133
Preis, H. P., Engraving Machine Co. 188
Price-Driscoll Corporation 273
Projectile & Engineering Company Ltd., The 77
Pyramid Plastics, Inc. 247

Quinn-Berry Corp. 277

Radio Corporation of America .. 193
Radio Receptor Company, Inc. . 31
Reed-Prentice Corp. 8
Reifenhauser, A. 28
Rheem Manufacturing Company 57
Rhode Island Laboratories, Inc. 235
Richardson Company, The 74
Robbins Tool and Die Company 78
Rohden Manufacturing Co. 203
Rohm & Haas Company, The Resinous Products Division .. 75
Rubber Corporation of America 233

Safety Car Heating and Lighting Company, Inc., The 222
Santay Corporation 53
Sarco Company, Inc. 226
Schulz, Richard O., Co. 226
Schwab & Frank Incorporated .. 208
Schwartz Chemical Co., Inc. ... 181
Scientific Design Company, Inc. 41
Scranton Plastic Laminating Corp. 243
Shaw, Francis, & Company Limited 32
Sheffield Plastics, Inc. 239
Sinko Mfg. & Tool Co. 200
Socony-Vacuum Oil Co., Inc. ... 239
Southern Screw Company 207
Spencer Chemical Company 225
Standard Machinery Co., The .. 51
Sterling Electric Motors 227
Sterling, Inc. 271
Stokes, F. J., Machine Company 127
Sturtevant Mill Company 67
Swedlow Plastics Co. 249
Swift, M., & Sons, Inc. 188
Sylvania Electric Products Inc. .. 18

Tennessee Products & Chemical Corporation 66
Thermomat Co., Inc. 173
Thropp, Wm. R., & Sons, Division of J. M. Lehmann Co., Inc. .. 42
Tinnerman Products, Inc. 76
Transilwrap Co. 173
Tupper Corporation 48
Turner Halsey Company 204

Union Carbide and Carbon Corporation, Bakelite Company 129, 177, 178
Union Carbide and Carbon Corporation, Carbide and Carbon Chemicals Company 130
United States Rubber Company (Royalite) 82

Vacuum Sales Co. 71
Van Dorn Iron Works Co., The 175

Wallace & Tiernan Incorporated, Lucidol Division 194
Waterbury Companies, Inc. 205
Watson-Standard Co. 47
Watson-Stillman Company, The, Division of H. K. Porter Company, Inc. 133
Welding Engineers, Inc. 265
Wellington Sears Company 49
West Instrument Corporation .. 223
Westchester Plastics, Inc. 169
Wheeleo Instruments Division, Barber-Colman Company 60
Wiegand, Edwin L., Co. 39
Wiley, John, & Sons, Inc. 205
Windsor, R. H., Ltd. 88
Witco Chemical Company 267
Wood, R. D., Company 34
Worcester Moulded Plastics Co. 161

Zack Industries 276
Zenith Plastics Co. 217

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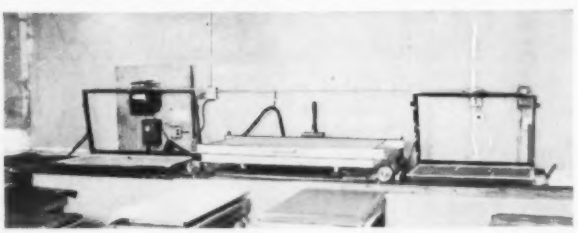
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100% Elastic Modulus (psi)	1500	1600
Shore Hardness (10 sec)	78	78
Low Temp. Flexibility Tf (°C)	—25	—26
Activated Carbon Volatility (24 hrs. @ 90°C.)	9.2%	5.0%

*Note: Formulation
Vinyl Resin 65%
Plasticizer 35%
Ba-Cd Stabilizer 3 phr

W&D 4998

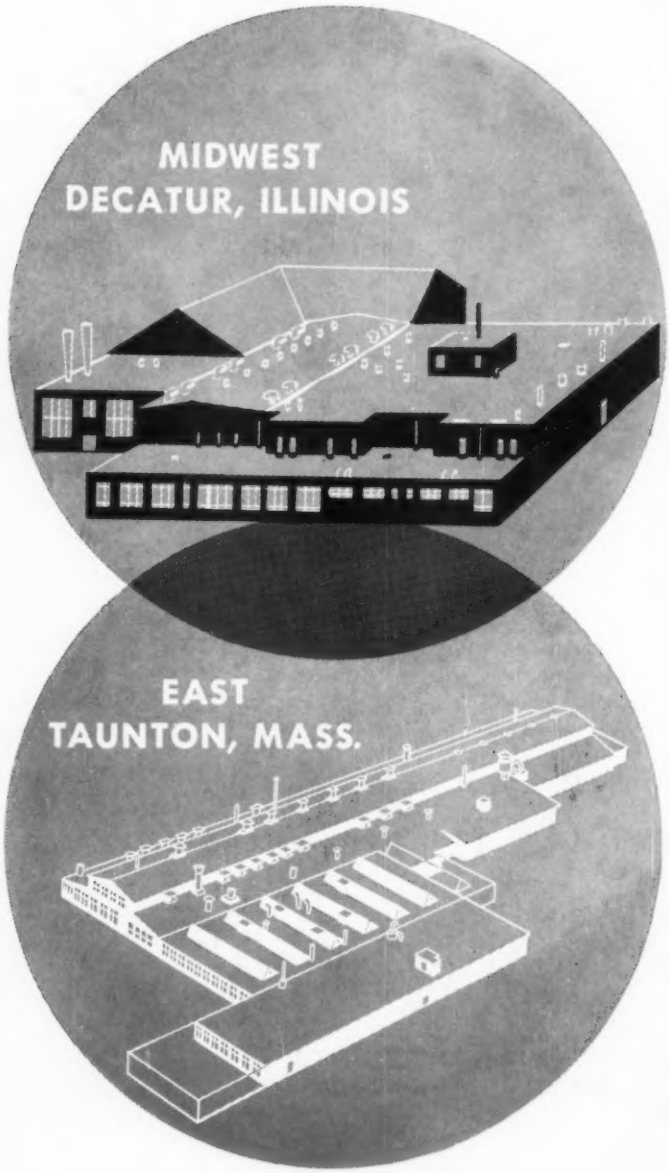
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